
Appendix IX

The Effects of Climate Change on Yields and Water Use of Major California Crops

Richard M. Adams, Professor
Junjie Wu, Associate Professor
Laurie L. Houston, Staff Research Associate
Agricultural and Resource Economics
Oregon State University
Corvallis, Oregon

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1. Introduction

This research is part of a major research program funded by the Commission to assess the effects of climate change on California agriculture and other selected economic sectors. In particular, it supports the efforts of the University of California at Davis, directed by Professors Richard E. Howitt and Jay R. Lund, in assessing the economic consequences of climate change for California agriculture. The objectives of the research reported here are to (1) develop crop yield response functions that estimate the effect of changes in temperature and precipitation on yields of major crops in California and (2) estimate changes in evapotranspiration (ET) for these same crops. Estimates of ET are important in any analysis of climate change in California, given that most crops grown in the state are irrigated. These estimates of yield and water use changes are presented for a range of climate change scenarios and also include assumptions about technological progress and the effects of carbon dioxide (CO_2) levels on crop yields.

Professor Howitt used this information on crop yields and water use for a suite of scenarios as input for the Statewide Water and Agricultural Production (SWAP) model. SWAP is an economic optimization model of the California agricultural sector; it is used in conjunction with a model of water supply and allocation that Professor Lund developed to assess the overall effects of climate change on agriculture.

2. Background and Procedures

In the past decade, a number of studies have estimated the effects of potential climate change on crop yields. (See Rosenzweig and Hillel, 1998, or Adams et al., 1999a, for reviews and discussions of major findings from such studies.) These studies have focused primarily on major grains and oilseed crops, given their importance in total U.S. agricultural production. Some of the more recent investigations have explored implications for certain warm season or specialty crops, such as fruits or vegetables (e.g., Adams et al., 1999b). Some studies have also estimated changes in ET for irrigated crops. The most complete collection of data on crop yields and water use was generated in support of the recent U.S. National Assessment of Climate Change (Reilly et al., 2001). However, many of the crops grown in California are not included in recent national studies. In addition, many of the crops evaluated in national studies are rain-fed, whereas the majority of California's crops are irrigated. In this study, then, we have developed new crop yield and water use estimates appropriate for California.

Previous investigators have employed two general techniques to estimate effects of climate change on agricultural yields and ET: (1) crop biophysical simulation models, such as CERES or EPIC (exemplified by the studies of Rosenzweig and associates), and (2) statistics-based models

that use historical data on crop yields and weather variables to estimate how yields differ across climate zones (Mendelsohn et al., 1999; Segerson and Dixon, 1999). Each technique has certain advantages. For example, crop simulation models allow the analyst to examine a range of weather possibilities, some of which may lie outside the historical record. Crop simulation models also allow inclusion of future changes in CO₂ levels. Elevated CO₂ levels have been shown to have a yield-enhancing effect on most crops; these yield increases may offset some negative effects of warming on crops. Crop simulation models also include farmer adaptations of strategies such as changes in planting dates or crop varieties that may offset adverse effects of climate change. Although statistical models can generally address such questions, they cannot deal directly with CO₂ levels or climate change outside the historical record.

In this study, we relied on statistical procedures similar to those found in Segerson and Dixon (1999) to obtain estimates of yield and ET changes for California crops. However, because the data on which these estimates are based does not include changes in CO₂, we incorporated results from existing crop simulation models to account for CO₂ effects. The statistical procedures (discussed below) yield plausible results on the impact of climate change on major crops for each production region in California.

3. Statistical Models and Procedures

This section discusses the estimation of yield functions that are used to predict the impact of alternative climate change scenarios on crop yields. It also discusses the procedure used to estimate ET changes. To reflect the spatial heterogeneity of soil, climate, and production systems in the study region, the state is divided into four major production regions based on climate conditions and cropping systems: (1) the Sacramento Valley and the delta, (2) the San Joaquin Valley and the desert, (3) the northeast and mountain area, and (4) the coast region. Each region comprises multiple counties; the counties represent the cross-sectional component of the data. In general, data are available for each county for the period from 1972 to 2000. Within each production region, climate and cropping systems are relatively more homogenous than across regions.

Crop yield functions

For each production region, the major crops are identified and a yield function is estimated for each crop. The dependent variables of the yield functions are crop yields per acre, and the independent variables include seasonal temperatures and precipitation levels, land quality measures, and a time trend variable that reflects technological progress. Specifically, the yield functions are

$$Y_{it} = \alpha_0 + T_{it}\alpha_1 + T_{it}^2\alpha_2 + P_{it}\beta_1 + P_{it}^2\beta_2 + L_{it}\gamma_1 + L_{it}^2\gamma_2 + \delta t + \varepsilon_{it}, \quad (1)$$

where:

- i = an index of each county in each region
 t = an index of year
 Y = crop yield per acre
 T = a vector of monthly average maximum daily temperatures during the growing season ($^{\circ}\text{F}$)
 T^2 = a vector of variables in T squared
 P = a vector of monthly precipitation during the growing season (inches)
 P^2 = a vector of variables in P squared
 L = a vector of land quality variables
 L^2 = a vector of variables in L squared
 ε = an error term.

A quadratic functional form is used to estimate the yield functions. This functional form allows climate changes to have a nonmonotonic effect on crop yield (i.e., a potential increase in yields under warming in cooler locations and a decrease in yields under warming in warmer locations as temperatures increase). The quadratic functional form is also one of the most commonly used functional forms for yield functions in the agronomic literature.

Data and sources

We downloaded a time series of yield and acreage data for California crops at the county level from Web sites sponsored by the National Agricultural Statistics Service (NASS). One Web page provided data for the years 1972 through 2000 for barley, corn grain, corn silage, cotton, dry edible beans, oats, rice, sorghum, sugar beets, and wheat (NASS, 2001b). The other provided data only back to 1980 for alfalfa hay, almonds, avocados, grapes (table, raisin, and wine), olives, Valencia oranges, potatoes, prunes, fresh market tomatoes, processing tomatoes, and walnuts (NASS, 2001a).

We collected precipitation and weather data for each county in California from 1972 through 2000 from the Western Regional Climate Center's (WRCC) Web site (WRCC, 2001). Specifically, we downloaded data for monthly average, maximum, and minimum temperatures in degrees Fahrenheit, and for monthly total precipitation in inches from this site.

Data on consumptive water use for irrigation were downloaded from the U.S. Geological Service (USGS) Web site (USGS, 2001). This information is collected at 5 year intervals, and data were available by county for 1985 and 1995.

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The time series and cross-sectional data used in this report encompassed yield data for 24 crops in 40 counties, and temperature and precipitation data for 40 counties. Table 1 reports the total observations used to estimate yield responses for each crop and region, and Table 2 presents the number of observations for those crops estimated across the four regions (i.e., the entire state). Table 3 lists the counties in California included in the data (40 out of 56).

Finally, to account for CO₂ “fertilizer” effects on yields, data were taken from an earlier study by Adams et al. (1998). This study contained yield estimates derived from plant biophysical simulation models (CERES and EPIC), with and without CO₂ effects. We used these differences in yields (between with and without) to adjust the crop yield estimates given here to account for increased CO₂ levels (to 2090). Table 4 reports the adjustment factors for each crop.

Table 1. Total observations used to estimate yield responses

Sacramento Valley and delta		San Joaquin Valley and desert	
Crop	Number of observations	Crop	Number of observations
Barley	879	Barley	933
Corn grain	285	Corn grain	294
Corn silage	155	Corn silage	172
Dry beans	145	Cotton (pima)	67
Oats	227	Cotton	421
Rice	239	Dry beans	155
Sorghum grain	112	Oats	247
Sugar beets	157	Rice	233
Wheat (durum)	97	Sorghum grain	118
Wheat (winter)	937	Sugar beets	164
		Wheat (durum)	225
		Wheat (winter)	979
Northeast and mountain		Coast	
Barley	404	Barley	682
Corn grain	40	Corn grain	99
Oats	142	Corn silage	76
Wheat (winter)	423	Cotton	48
		Dry beans	71
		Oats	180
		Wheat (winter)	601

Table 2. Total observations to estimate crop yield response equation from all regions combined

Crop	Number of observations
Alfalfa hay	377
Almonds	238
Avocados	83
Grapes (raisin and table grapes)	205
Grapes (wine)	329
Olives	140
Potatoes	87
Prunes	147
Tomatoes (fresh)	205
Tomatoes (processed)	244
Valencia oranges	79
Walnuts	393

Table 3. Counties for which temperature, precipitation, and yield data were collected

Butte	Lake	Orange	Siskiyou
Calaveras	Lassen	Placer	Solano
Colusa	Los Angeles	Riverside	Sonoma
Contra Costa	Madera	Sacramento	Stanislaus
El Dorado	Maraposa	San Benito	Sutter
Fresno	Merced	San Diego	Tehema
Glenn	Modoc	San Joaquin	Tulare
Imperial	Monterey	San Luis Obispo	Tuolumne
Kern	Napa	Santa Barbara	Yolo
Kings	Nevada	Shasta	Yuba

Table 4. Percent change in irrigation water use, by uniform scenario, accounting for CO₂ effects^a

	Scenario							
	1	2	3	4	5	6	7	8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Region				Change in water use (% change/100)				
Sacramento and delta ^b	0.071	0.070	0.165	0.014	-0.042	0.000	0.163	0.000
San Joaquin Valley and desert ^c	0.074	0.074	0.157	0.024	-0.025	0.012	0.157	0.012
Northeast and mountain ^d	0.042	0.036	0.130	-0.014	-0.065	-0.027	0.120	-0.024
Coast ^e	0.203	0.203	0.374	0.100	-0.003	0.074	0.375	0.074

a. CO₂ effects on water use are based on data from Adams et al. (1999b).

b. Sacramento and delta region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

c. San Joaquin Valley and desert region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

d. Northeast and mountain region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

e. Coast region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Estimation procedures

Seasonal climate variables are included to reflect the impact of climate variations on crop yields. For corn and other crops grown during the spring and summer periods in California, monthly average maximum daily temperatures and monthly precipitation for the period from March through September are included in the yield functions. For the one crop in this analysis grown in the winter (winter wheat), monthly average maximum daily temperatures and monthly precipitations for the period of October through the next June are included in the yield function. Two land quality variables — percentages of high- and medium-quality cropland in a county — are included in all yield functions. High-quality cropland is defined as having land capability classes 1 and 2, and medium-quality cropland is defined as having land capability classes 3 and 4.

Because the yield functions are estimated using pooled time-series and cross-sectional data (i.e., across counties and over the period from 1972 to 2000 for most crops) and climate variables may be correlated, both heteroscedasticity and multicollinearity may arise in the yield functions. In the presence of heteroscedasticity, the least squares estimator no longer has minimum variances among all linear unbiased estimators, but is still unbiased and consistent. The least squares estimator in the presence of multicollinearity remains unbiased and in fact is still the Best Linear Unbiased Estimator (BLUE). Because all the standard assumptions are still met, the ordinary least squares (OLS) estimator retains all its desirable properties. The major undesirable consequence of multicollinearity is that the variances of the OLS estimates of the parameters of the collinear variables are quite large. As a result, it is uncertain as to which variable deserves the credit for jointly explained variation in the dependent variable (yields). The clear implication of multicollinearity is that estimated coefficients of any particular climate variable should be interpreted with caution (Segerson and Dixon, 1999). Most importantly, the result that a particular coefficient is insignificant at some standard level of significance should not be taken as compelling evidence that a particular variable is an irrelevant regressor. In the presence of multicollinearity, the model is most appropriately used to estimate the effect of climate changes where all temperature variables or all precipitation variables are changed by some common amount or percentage. When used this way, any inaccuracies of a particular coefficient are more likely to be offset by the coefficients of other collinear variables, and their joint impact is more likely to be estimated more accurately. Because the yield functions estimated in this study are used to predict the impact of climate changes on crop yields rather than to identify the importance of a particular coefficient on a particular climate variable, they are all estimated using a least squares estimator.

Irrigation water use equation

A simple statistical model is estimated to assess the effect of climate changes on irrigation water use in California. Because of the limited number of observations and the potential multicollinearity problem, a linear specification is used. The dependent variable is the consumptive water use for irrigation per acre. The independent variables include monthly average maximum daily temperatures from March to August and monthly precipitation from May to July.

A single water use model is estimated for the whole study region (California). Water use data are available from the USGS (average water use per acre across all crops) but for only 2 years (1985 and 1990). Because of the limited number of observations, we were unable to estimate a water use model for each of the four production regions and for each crop, as we did in the case of crop yield functions. We can assume that the general relationships between temperature and precipitation observed from the aggregate data are a reasonable proxy for the ET levels of each crop.

4. Estimation Results

Statistical results from the OLS estimates for each crop and region (a total of 46 equations) are presented in the attachment. For crops with adequate observations (e.g., corn for grain), regional-specific yield equations are estimated for each of the four production regions. When the number of observations for a crop is insufficient to estimate a regional-specific yield equation (mostly fruits and vegetables), a single equation is estimated for the state and then adapted to each region where such crops are grown. Regional-specific yield equations are estimated for corn for grain, corn for silage, barley, grain sorghum, dry beans, oats, winter wheat, cotton, cotton pima, wheat durum, rice, and sugar beets, although not every crop is grown in every region. The results for Sacramento Valley and the delta include yield equations for corn for grain, corn for silage, barley, grain sorghum, dry beans, oats, winter wheat, wheat durum, rice, and sugar beets. The results for San Joaquin Valley and desert include yield functions for corn for grain, corn for silage, barley, grain sorghum, cotton, cotton (pima), dry beans, oats, winter wheat, wheat durum, rice, and sugar beets. The results for the northeast and mountain area include yield functions for corn for grain, barley, oats, and winter wheat. The results for the Coast include yield functions for corn for grain, corn for silage, barley, cotton, dry beans, oats, and winter wheat. For oranges, hay alfalfa, grapes (table, raisin, wine), tomatoes (fresh and processed), almonds, English walnuts, prunes (dried), olives, avocados, and Irish potatoes, a single yield function is estimated for each crop in California. The single equation is then used in regions growing each crop by adapting it to the climatic and soil data for that region.

The results presented in the attachment show that the models fit the data well for most crops. The R-squares of the estimated crop yield equations for Sacramento Valley and the delta vary from 0.33 to 0.93, with half above 0.64. For the crop yield equations in San Joaquin Valley and desert, R-squares vary from 0.24 to 0.85, with all but three above 0.50. The crop yield equations also fit the data well in the northeast and mountain area, with all R-squares above 0.60. The performance of crop yield equations varies across crops in the coastal region, with R-squares that vary from 0.22 to 0.99. The R-squares of the yield equations for the 13 fruits and vegetables vary from 0.21 to 0.82, with all but 1 above 0.40.

In addition to the overall “goodness of fit,” the estimated coefficients are generally consistent with agronomic expectations. Tests with the coefficients show that for warm-weather adapted crops (e.g., corn), an increase in temperatures in cooler regions generally increases crop yields. Likewise, for dry-weather adapted crops (e.g., some fruits and vegetables), an increase in precipitation during the growing season generally reduces crop yields (primarily through adverse effects on fruit set or on harvest quality). However, because of high correlation of some climate variables, coefficients on them may be statistically insignificant in some of the yield equations. As we pointed out earlier, the least squares estimator in the presence of multicollinearity is still the BLUE. But estimated coefficients of any particular climate variable should be interpreted

with caution. These types of statistical models are most appropriately used to estimate the effect of climate changes where all temperature variables or all precipitation variables are changed by some common amount or percentage.

The statistical results for the water use equation are presented in the attachment. The model explains 42% of variations of irrigation water use across the study region. The results suggest that maximum daily temperatures in July have the largest impact on water use. An increase in the average maximum daily temperatures in July by 1°F will increase irrigation water use by 0.14 acre-feet per acre. Precipitation in June and July reduces irrigation water use. An increase in precipitation by 1 inch in each month reduces consumptive water use for irrigation by 0.28 and 0.22 acre-feet per acre, respectively. To assess the effects of climate change on water use (in terms of ET), the forecast changes in temperature and precipitation (either from the uniform scenarios or the general circulation models [GCMs]) for each of the four regions are used in the water use equation. In addition, the effects of elevated CO₂ on irrigation water use in each region are included in the water use estimates. Procedures for this adjustment are described in the next section.

5. Simulating the Impact of Climate Changes on Crop Yields and Water Use

The estimated yield functions for each crop are used to simulate the effect of climate changes, as reflected in each scenario, on crop yields in the four major production regions in California. A three-step procedure is used in the simulations. First, we estimate the baseline yield for each crop in each production region by substituting the means of all variables into the estimated yield functions. These baseline yields are compared with actual yields to evaluate their reasonableness. Second, we estimate crop yields in each production region under each climate change scenario. Finally, we estimate the impact of climate changes on crop yields by comparing baseline yields with the estimated crop yields under the suite of climate change scenarios that the Commission provided. These changes in yield, measured as percent changes relative to the base case, are reported in Tables 5 through 28. Each table contains information describing the climate change scenario, the technological change assumption, and the treatment of the CO₂ fertilizer effect in the reported results.

Research has demonstrated that elevated levels of CO₂ reduce crop ET, primarily through a reduction in stomatal apertures. For example, controlled experiments that measured crop water use (ET) under elevated CO₂ have shown that most crops produce similar or increased yields with less water (for a discussion of the mechanisms leading to this outcome and a review of recent studies, see Rosenzweig and Hillel, 1998).

To account for CO₂ effects on water use in this study, the regression equation that relates water use (ET) to temperature and precipitation (discussed previously), has been modified to reflect the increased water use efficiency associated with elevated CO₂ levels. This modification is based on results from crop simulation modeling exercises performed in support of the research reported in Adams et al. (1999b). Specifically, estimated ET changes that Cynthia Rosenzweig generated for several crops in a previous EPRI project (Mendelsohn and Neumann, 1999) are used to develop a weighted average (by crops grown in each region) adjustment factor. The CO₂-adjusted irrigation water use values are reported in Tables 4, 29, and 30.

The set of simulations performed here also includes possible technological changes that may increase yields. In the past 40 years, national crop yields have increased from 1% to 2% per year. Although there is debate about the sustainability of such yield increases, it is likely that yields will continue to increase in the future. Thus, if a climate change is predicted for a specific future date, it is likely that future yields will reflect both the climate effects and the impact of technological progress. In this study, we estimated the impact of technological progress on crop yields based on the estimated coefficients on the time trend variable (from the statistical model) and assumptions about the rate of future technological progress.

6. Results and Implications

A suite of climate change scenarios was evaluated with the simulation model described previously. The suite includes eight uniform climate change scenarios, in which seasonal climate variables (i.e., monthly temperature and precipitation) in each region are adjusted by uniform increases in temperature and precipitation. In addition, scenarios derived from the two GCMs, at three time periods, give rise to another six simulations for each region. This set of 14 scenarios results in 64 simulations of possible yield effects associated with each climate possibility. Sensitivity analyses related to treatment of CO₂ fertilizer effects and technological change add to this number of simulations (an additional 128 simulations). The scenarios were also evaluated with respect to their implications for water use (ET). The results of the simulations are presented in Tables 5 through 54 (each table contains multiple scenarios; Tables 5 through 54 appear at the end of this appendix).

The tables are organized in the following order: the simulations (for both water use and yield effects) using the uniform climate change scenarios are presented in Tables 5 through 28; Tables 29 and 30 present the climate change projections from the two GCMs; and Tables 31 through 54 report the results of the GCM climate forecasts in terms of changes in water use and crop yield effects. The tables report results in terms of “climate change only” effects, climate change plus CO₂ fertilizer effects, and climate change plus technology effects, under two assumptions about technological progress (an annual growth in yields of 0.25% and 1.0%, respectively). Each table is keyed to a specific region in California. By presenting the results in

this fashion, we can see the effects of individual factors on yields, such as the effects of climate change only, as well as the effects of adding additional factors that may alter future crop yields and water use (in this case, CO₂ fertilizer effects and technological change). By examining each table (i.e., each region) and then comparing those results across various scenarios and assumptions about the CO₂ and technology, it is possible to assess how crop yields (and water use) change as climate, CO₂, and technology change).

The results reported in each table are measured as percentage changes from a base period yield. To obtain these changes, then, an underlying set of base yields is estimated. For most analyses reported in the tables, the base yields correspond to yields estimated with current climate conditions (i.e., these base case yields represent current crop yields). The effects of climate change are then calculated by dividing projected yields (under climate change) by the base case yields. The exception to this process is in the treatment of technology. Here, the base case yields are the yields at some future time period (identified in each table), where this future yield is obtained by compounding yield growth over time at either 0.25% or 1.0% per year. This base case is then used in conjunction with the estimated yields under climate change and technology to calculate the percentage of change in crop yields to that point in time.

Given the extremely large number of estimates contained within the 50 tables presented here, we chose to report results in terms of major themes or trends, rather than focus on one specific crop or region. The results should be viewed as providing a range of possible outcomes, not a specific prediction of climate effects on crops in California. The collection of results can also suggest the general sensitivity of California crop production to climate change. When used as input in the economic model supplied by Professor Howitt, this range of results can then be translated into their economic implications. This economic output can then furnish guidance about the potential importance of climate change on the welfare of California's agricultural sector.

A number of general themes arise from the results presented in the 50 tables. The first pertains to a pattern observed in the “climate change only” results (but which follows through the other sets of results). This general observation indicates that warming during the crop-growing season is generally beneficial to the cooler regions of California (the mountain/northeast, coastal, and to a lesser degree, the Sacramento/delta regions), but negative to the San Joaquin/desert region. This result is consistent with other studies, such as the series of national-level studies (e.g., Adams et al., 1988, 1995, 1998) that showed gains in crop productivity in more northern latitudes of the United States, losses to some of the southern (and warmer) regions of the country. The explanation for these effects is that crop productivity in cooler regions can benefit from additional degree-days of warming, whereas crops in currently warm regions may already be at the heat threshold level.

A second general observation relates to precipitation, water use, and water demand. As Tables 5 and 30 indicate, warming generally increases crop water demand, although the accompanying increases in CO₂ help mitigate these increases. The degree of increase in water use varies across region and climate scenario, but most regions and scenarios show a pattern of increased water use. Increases in precipitation during the growing season have little impact on water use or crop yields, because virtually all economically important crops in California are grown under irrigated conditions and because rainfall amounts during the state's growing season are typically very limited. Thus, any changes in precipitation are not likely to have any effect on yields or water demand. In fact, for some crops, any increase in precipitation is negative because precipitation during the growing season may adversely affect crop quality. This is particularly important during the late summer period for many fruit and nut crops. Annual precipitation is extremely important to California agriculture because it determines the total quantity of runoff and thus water supply for agriculture. These effects of changes in precipitation are being considered in Professor Lund's research on this project.

A third central theme that emerges from the analysis is the importance of the CO₂ assumption. Specifically, the CO₂ fertilizer effect, as used here, results in an increase in yield (for those cases where climate change was beneficial), or offsets/mitigates the negative effects of climate change in regions where changes in climatic variables reduce yields. This result is expected, given that yields for each crop in this study were adjusted by a positive factor to reflect the yield-enhancing properties of CO₂. As noted in the procedures section, we derived these adjustment factors from previous studies (which use crop biophysical simulation models). A large number of crop experiments have concluded that elevated CO₂ levels will be beneficial to plant growth (and yields). Although there is debate about whether these beneficial effects will continue beyond some level of CO₂ elevation, it seems clear that there will be some positive effect over ranges examined in most studies (here we assume a CO₂ level of 540 ppm). As noted above, CO₂ is also assumed to decrease crop water use (ET).

A fourth observation relates to the role of technology. To examine this, we included Tables 13 through 28 and Tables 39 through 54 representing two technology assumptions, a 0.25% increase and a 1.0% increase per year. These effects are evaluated for three potential time periods (to 2010, to 2060, and to 2100). The important implication of technology is its effect on total yields, rather than its effect in concert with effects of climate change. Specifically, the increase in yields resulting strictly from the two technological changes is dramatic. For example, for most crops, a very modest growth rate (of 0.25% per year) results in crop yields increasing by more than 100% for the 2060 and 2100 time periods (see, for example, some of the yield increases projected for fruit and nut crops). With a 1.0% increase per year, some yields increase two- to three-fold over current levels. Whether such yields are agronomically achievable is open to debate (such increases may exceed the photosynthetic capabilities of the plant). However, technological change will certainly bring about some increases in yields in the next 100 years. By using a base case that includes the technological changes, the results in the technological tables focuses on the

climate change effects (note that the changes in the technological change tables are similar to the “climate change only” results). The significance of the technological change analyses will occur in the economic modeling component of this study, where the base yields in the economic model will be adjusted to reflect the technological change assumption (Professor Richard E. Howitt, University of California at David, December 11, 2001, personal communication).

In summary, this appendix presents a broad range of estimates of the effects of climate change on crop yields and water use. The results should be used to draw general implications about the ability of California’s agricultural sector to adapt to climate change. The results show that climate change is not likely to have serious adverse effects on the yields of most California crops. Indeed, most of the results suggest that yields will increase, on average, over current levels, if water supplies remain adequate to produce these crops. Such increases in yields may allow California to maintain its dominance in the production of many crops with fewer acres devoted to agricultural use. In a state facing increased demands for land and water, these yield increases are potentially important. The economic implications of these crop yield and water use results on producers, consumers, and others in California will be evaluated and presented by Professor Howitt.

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Table 5. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with no CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	0.1162	0.1454	0.2451	0.0750	0.0213	0.0596	0.3002	0.0465
Corn silage	-0.0019	0.0155	-0.0256	0.0115	0.0046	0.0098	0.0167	0.0041
Barley	-0.1122	-0.1317	-0.2027	-0.0750	-0.0239	-0.0614	-0.2390	-0.0526
Sorghum	-0.0309	-0.0404	-0.0687	-0.0231	-0.0128	-0.0197	-0.0849	-0.0151
Dry beans	0.0327	0.2707	0.0633	0.1229	0.0289	0.0910	0.6484	0.0143
Oats	-0.0064	-0.0218	-0.0356	-0.0104	-0.0030	-0.0080	-0.0493	0.0024
Rice	0.0685	0.0594	0.0988	0.0399	0.0146	0.0342	0.0789	0.0377
Sugar beets	0.0813	0.1087	0.1672	0.0561	0.0159	0.0445	0.2248	0.0335
Winter wheat	0.0092	-0.0276	0.0418	-0.0233	-0.0109	-0.0204	-0.0178	-0.0016
Valencia orange	0.0585	-0.0205	0.0778	0.0177	0.0163	0.0222	-0.1782	0.0337
Hay alfalfa	0.1008	0.1064	0.1640	0.0632	0.0208	0.0524	0.1809	0.0513
Grapes (table, raisin)	-0.1752	-0.3499	-0.4174	-0.1655	-0.0418	-0.1264	-0.7988	-0.0593
Grapes (wine)	0.1288	0.1055	0.1910	0.0680	0.0239	0.0579	0.1530	0.0697
Tomatoes (fresh)	-0.0932	-0.0831	-0.2858	-0.0260	-0.0008	-0.0169	-0.2482	-0.0172
Tomatoes (processed)	0.0436	0.0047	0.0719	0.0084	0.0045	0.0087	-0.0203	0.0220
Almonds	0.5384	0.5478	0.9664	0.3121	0.1082	0.2580	1.0131	0.2603
English walnuts	0.0749	0.0183	0.1009	0.0180	0.0076	0.0171	-0.0049	0.0428
Prunes (dried)	0.3839	0.4094	0.7545	0.2173	0.0631	0.1748	0.8152	0.1661
Olives	-0.2111	-0.2183	-0.4777	-0.1064	-0.0276	-0.0835	-0.4777	-0.0772
Potatoes	-0.1124	-0.1180	-0.2010	-0.0678	-0.0217	-0.0558	-0.2106	-0.0532

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 6. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with no CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop	Change in yield (% change/100)							
Corn grain	-0.0634	-0.0714	-0.1647	-0.0283	-0.0021	-0.0201	-0.1813	-0.0167
Corn silage	0.0329	0.0492	0.0411	0.0324	0.0121	0.0274	0.0701	0.0196
Barley	-0.1386	-0.1817	-0.2579	-0.1027	-0.0363	-0.0843	-0.3431	-0.0657
Sorghum	-0.0535	-0.0594	-0.0774	-0.0423	-0.0245	-0.0378	-0.0865	-0.0347
Cotton (pima)	-0.0612	-0.0830	-0.1714	-0.0396	-0.0357	-0.0346	-0.2453	-0.0321
Cotton	-0.1072	-0.1307	-0.2359	-0.0764	-0.0475	-0.0664	-0.2782	-0.0554
Dry beans	-0.0914	-0.1359	-0.1563	-0.0751	-0.0266	-0.0612	-0.2668	-0.0472
Oats	-0.3346	-0.3308	-0.7937	-0.1525	-0.0427	-0.1187	-0.7799	-0.1189
Rice	-0.0756	-0.1001	-0.1764	-0.0426	-0.0003	-0.0302	-0.2309	-0.0211
Sugar beets	-0.0753	-0.0579	-0.1096	-0.0461	-0.0310	-0.0429	-0.0694	-0.0491
Winter wheat	-0.0326	-0.0635	-0.1009	-0.0326	-0.0176	-0.0269	-0.1507	-0.0111
Durum wheat	0.0290	0.0467	0.0293	0.0256	-0.0051	0.0186	0.0609	0.0102
Valencia orange	-0.1452	-0.2475	-0.1530	-0.1837	-0.1601	-0.1726	-0.4493	-0.1498
Hay alfalfa	0.0871	0.0928	0.1432	0.0540	0.0160	0.0443	0.1595	0.0430
Grapes (table, raisin)	-0.3819	-0.5247	-0.7539	-0.2747	-0.0850	-0.2196	-1.0812	-0.1684
Grapes (wine)	0.1647	0.1523	0.2127	0.1199	0.0814	0.1110	0.1928	0.1174
Tomatoes (fresh)	-0.3742	-0.3566	-0.7157	-0.2170	-0.1115	-0.1877	-0.6641	-0.1915
Tomatoes (processed)	0.0211	-0.0103	0.0448	-0.0071	-0.0111	-0.0070	-0.0330	0.0030
Almonds	0.5384	0.5478	0.9664	0.3121	0.1082	0.2580	1.0131	0.2603
English walnuts	0.0760	0.0407	0.0850	0.0429	0.0358	0.0425	0.0153	0.0578
Prunes (dried)	0.4340	0.4509	0.7967	0.2568	0.0911	0.2125	0.8384	0.2071
Olives	-0.3995	-0.3989	-0.8092	-0.2088	-0.0547	-0.1669	-0.7952	-0.1643
Avocados	0.0099	-0.1612	0.0022	-0.0659	-0.0151	-0.0466	-0.4277	0.0063
Potatoes	-0.1490	-0.1527	-0.2543	-0.0936	-0.0388	-0.0794	-0.2610	-0.0776

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 7. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with no CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	-0.0628	-0.0334	-0.1942	-0.0082	-0.0098	-0.0065	-0.1336	-0.0187
Corn silage	0.0621	0.0621	0.1025	0.0374	0.0125	0.0312	0.1025	0.0312
Barley	0.1741	0.1489	0.4208	0.0609	0.0112	0.0452	0.3804	0.0581
Oats	-0.0744	-0.0814	-0.0390	-0.0855	-0.0798	-0.0849	-0.0527	-0.0819
Rice	-0.1574	-0.1867	0.0079	-0.2568	-0.3147	-0.2720	-0.0435	-0.2580
Sugar beets	-0.0034	0.0602	-0.0018	0.0354	0.0125	0.0286	0.1070	-0.0026
Winter wheat	-0.1275	-0.1239	-0.1622	-0.1004	-0.0738	-0.0941	-0.1561	-0.0959
Hay alfalfa	0.1443	0.1484	0.2383	0.0867	0.0260	0.0713	0.2539	0.0713
Grapes (wine)	0.6184	0.5571	0.8235	0.4440	0.3208	0.4150	0.7226	0.4459
English walnuts	0.4310	0.2699	0.5829	0.2305	0.1747	0.2203	0.2956	0.2966
Olives	-0.0198	-0.0203	-0.1509	0.0174	0.0284	0.0227	-0.1421	0.0251
Potatoes	-0.1071	-0.1131	-0.1699	-0.0775	-0.0454	-0.0690	-0.1802	-0.0661

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 8. Percent change in yields for the coast region of California,^a by uniform scenario, with no CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	0.3906	0.3201	0.5398	0.2812	0.2255	0.2699	0.3431	0.2873
Corn silage	-0.3425	-0.3763	-0.4845	-0.3080	-0.2736	-0.2958	-0.5669	-0.2848
Barley	-0.0091	-0.0060	0.0268	-0.0152	-0.0126	-0.0157	0.0357	-0.0164
Dry beans	0.1465	-0.2329	0.2912	-0.0888	0.0065	-0.0551	-0.5985	0.0767
Oats	0.2183	0.1712	0.2762	0.1855	0.2084	0.1911	0.1641	0.2071
Sugar beets	0.2848	0.4662	0.5684	0.2627	0.0846	0.2132	0.8653	0.1213
Winter wheat	-0.1757	-0.1399	-0.0673	-0.1810	-0.1966	-0.1877	-0.0145	-0.2071
Valencia orange	-0.1891	-0.2151	-0.2751	-0.1443	-0.0923	-0.1292	-0.3778	-0.1295
Hay alfalfa	0.1624	0.1704	0.2076	0.1369	0.1042	0.1285	0.2288	0.1262
Grapes-wine	0.6524	0.5935	0.6003	0.6268	0.6454	0.6337	0.5041	0.6635
Tomatoes (fresh)	0.0769	0.0905	0.0608	0.0522	-0.0110	0.0385	0.0997	0.0354
Tomatoes (processed)	-0.0351	-0.0736	-0.0023	-0.0724	-0.0794	-0.0729	-0.0954	-0.0601
Almonds	0.5384	0.5478	0.9664	0.3121	0.1082	0.2580	1.0131	0.2603
English walnuts	0.5485	0.4386	0.5081	0.4926	0.5271	0.5046	0.3025	0.5545
Prunes (dried)	0.5833	0.6153	0.8854	0.4700	0.3704	0.4404	0.9605	0.4293
Avocados	0.0404	-0.1158	0.0572	-0.0418	-0.0108	-0.0278	-0.3430	0.0188
Potatoes	-0.2205	-0.2270	-0.2892	-0.1877	-0.1521	-0.1784	-0.3005	-0.1752

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 9. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	0.1462	0.1754	0.2751	0.1050	0.0513	0.0896	0.3302	0.0765
Corn silage	0.0281	0.0455	0.0044	0.0415	0.0346	0.0398	0.0467	0.0341
Barley	0.0478	0.0283	-0.0427	0.0850	0.1361	0.0986	-0.0790	0.1074
Sorghum	0.0391	0.0296	0.0013	0.0469	0.0572	0.0503	-0.0149	0.0549
Dry beans	0.2327	0.4707	0.2633	0.3229	0.2289	0.2910	0.8484	0.2143
Oats	0.1536	0.1382	0.1244	0.1496	0.1570	0.1520	0.1107	0.1624
Rice	0.2185	0.2094	0.2488	0.1899	0.1646	0.1842	0.2289	0.1877
Sugar beets	0.2813	0.3087	0.3672	0.2561	0.2159	0.2445	0.4248	0.2335
Winter wheat	0.1692	0.1324	0.2018	0.1367	0.1491	0.1396	0.1422	0.1584
Valencia orange	0.3785	0.2995	0.3978	0.3377	0.3363	0.3422	0.1418	0.3537
Hay alfalfa	0.2008	0.2064	0.2640	0.1632	0.1208	0.1524	0.2809	0.1513
Grapes (table, raisin)	0.0748	-0.0999	-0.1674	0.0845	0.2082	0.1236	-0.5488	0.1907
Grapes (wine)	0.3788	0.3555	0.4410	0.3180	0.2739	0.3079	0.4030	0.3197
Tomatoes (fresh)	0.1568	0.1669	-0.0358	0.2240	0.2492	0.2331	0.0018	0.2328
Tomatoes (processed)	0.2936	0.2547	0.3219	0.2584	0.2545	0.2587	0.2297	0.2720
Almonds	0.7884	0.7978	1.2164	0.5621	0.3582	0.5080	1.2631	0.5103
English walnuts	0.3249	0.2683	0.3509	0.2680	0.2576	0.2671	0.2451	0.2928
Prunes (dried)	0.6339	0.6594	1.0045	0.4673	0.3131	0.4248	1.0652	0.4161
Olives	0.0389	0.0317	-0.2277	0.1436	0.2224	0.1665	-0.2277	0.1728
Potatoes	-0.0524	-0.0580	-0.1410	-0.0078	0.0383	0.0042	-0.1506	0.0068

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 10. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop	Change in yield (% change/100)							
Corn grain	-0.0334	-0.0414	-0.1347	0.0017	0.0279	0.0099	-0.1513	0.0133
Corn silage	0.0629	0.0792	0.0711	0.0624	0.0421	0.0574	0.1001	0.0496
Barley	0.0214	-0.0217	-0.0979	0.0573	0.1237	0.0757	-0.1831	0.0943
Sorghum	0.0165	0.0106	-0.0074	0.0277	0.0455	0.0322	-0.0165	0.0353
Cotton (pima)	0.0988	0.0770	-0.0114	0.1204	0.1243	0.1254	-0.0853	0.1279
Cotton	0.0528	0.0293	-0.0759	0.0836	0.1125	0.0936	-0.1182	0.1046
Dry beans	0.1086	0.0641	0.0437	0.1249	0.1734	0.1388	-0.0668	0.1528
Oats	-0.1746	-0.1708	-0.6337	0.0075	0.1173	0.0413	-0.6199	0.0411
Rice	0.0744	0.0499	-0.0264	0.1074	0.1497	0.1198	-0.0809	0.1289
Sugar beets	0.1247	0.1421	0.0904	0.1539	0.1690	0.1571	0.1306	0.1509
Winter wheat	0.1274	0.0965	0.0591	0.1274	0.1424	0.1331	0.0093	0.1489
Durum wheat	0.1890	0.2067	0.1893	0.1856	0.1549	0.1786	0.2209	0.1702
Valencia orange	0.1748	0.0725	0.1670	0.1363	0.1599	0.1474	-0.1293	0.1702
Hay alfalfa	0.1871	0.1928	0.2432	0.1540	0.1160	0.1443	0.2595	0.1430
Grapes (table, raisin)	-0.1319	-0.2747	-0.5039	-0.0247	0.1650	0.0304	-0.8312	0.0816
Grapes (wine)	0.4147	0.4023	0.4627	0.3699	0.3314	0.3610	0.4428	0.3674
Tomatoes (fresh)	-0.1242	-0.1066	-0.4657	0.0330	0.1385	0.0623	-0.4141	0.0585
Tomatoes (processed)	0.2711	0.2397	0.2948	0.2429	0.2389	0.2430	0.2170	0.2530
Almonds	0.7884	0.7978	1.2164	0.5621	0.3582	0.5080	1.2631	0.5103
English walnuts	0.3260	0.2907	0.3350	0.2929	0.2858	0.2925	0.2653	0.3078
Prunes (dried)	0.6840	0.7009	1.0467	0.5068	0.3411	0.4625	1.0884	0.4571
Olives	-0.1495	-0.1489	-0.5592	0.0412	0.1953	0.0831	-0.5452	0.0857
Avocados	0.2599	0.0888	0.2522	0.1841	0.2349	0.2034	-0.1777	0.2563
Potatoes	-0.0890	-0.0927	-0.1943	-0.0336	0.0212	-0.0194	-0.2010	-0.0176

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 11. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	-0.0328	-0.0034	-0.1642	0.0218	0.0202	0.0235	-0.1036	0.0113
Corn silage	0.0921	0.0921	0.1325	0.0674	0.0425	0.0612	0.1325	0.0612
Barley	0.3341	0.3089	0.5808	0.2209	0.1712	0.2052	0.5404	0.2181
Oats	0.0856	0.0786	0.1210	0.0745	0.0802	0.0751	0.1073	0.0781
Rice	-0.0074	-0.0367	0.1579	-0.1068	-0.1647	-0.1220	0.1065	-0.1080
Sugar beets	0.1966	0.2602	0.1982	0.2354	0.2125	0.2286	0.3070	0.1974
Winter wheat	0.0325	0.0361	-0.0022	0.0596	0.0862	0.0659	0.0039	0.0641
Hay alfalfa	0.2443	0.2484	0.3383	0.1867	0.1260	0.1713	0.3539	0.1713
Grapes (wine)	0.8684	0.8071	1.0735	0.6940	0.5708	0.6650	0.9726	0.6959
English walnuts	0.6810	0.5199	0.8329	0.4805	0.4247	0.4703	0.5456	0.5466
Olives	0.2302	0.2297	0.0991	0.2674	0.2784	0.2727	0.1079	0.2751
Potatoes	-0.0471	-0.0531	-0.1099	-0.0175	0.0146	-0.0090	-0.1202	-0.0061

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 12. Percent change in yields for the coast region of California,^a by uniform scenario, with CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0	0	0	0	0	0	0	0
Crop								
								Change in yield (% change/100)
Corn grain	0.4206	0.3501	0.5698	0.3112	0.2555	0.2999	0.3731	0.3173
Corn silage	-0.3125	-0.3463	-0.4545	-0.2780	-0.2436	-0.2658	-0.5369	-0.2548
Barley	0.1509	0.1540	0.1868	0.1448	0.1474	0.1443	0.1957	0.1436
Dry beans	0.3465	-0.0329	0.4912	0.1112	0.2065	0.1449	-0.3985	0.2767
Oats	0.3783	0.3312	0.4362	0.3455	0.3684	0.3511	0.3241	0.3671
Sugar beets	0.4848	0.6662	0.7684	0.4627	0.2846	0.4132	1.0653	0.3213
Winter wheat	-0.0157	0.0201	0.0927	-0.0210	-0.0366	-0.0277	0.1455	-0.0471
Valencia orange	0.1309	0.1049	0.0449	0.1757	0.2277	0.1908	-0.0578	0.1905
Hay alfalfa	0.2624	0.2704	0.3076	0.2369	0.2042	0.2285	0.3288	0.2262
Grapes (wine)	0.9024	0.8435	0.8503	0.8768	0.8954	0.8837	0.7541	0.9135
Tomatoes (fresh)	0.3269	0.3405	0.3108	0.3022	0.2390	0.2885	0.3497	0.2854
Tomatoes (processed)	0.2149	0.1764	0.2477	0.1776	0.1706	0.1771	0.1546	0.1899
Almonds	0.7884	0.7978	1.2164	0.5621	0.3582	0.5080	1.2631	0.5103
English walnuts	0.7985	0.6886	0.7581	0.7426	0.7771	0.7546	0.5525	0.8045
Prunes (dried)	0.8333	0.8653	1.1354	0.7200	0.6204	0.6904	1.2105	0.6793
Avocados	0.2904	0.1342	0.3072	0.2082	0.2392	0.2222	-0.0930	0.2688
Potatoes	-0.1605	-0.1670	-0.2292	-0.1277	-0.0921	-0.1184	-0.2405	-0.1152

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 13. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with a 0.25% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	0.0719	0.0900	0.1517	0.0532	0.0176	0.0494	0.2487	0.0385
Corn silage	-0.0013	0.0108	-0.0178	0.0089	0.0040	0.0085	0.0145	0.0036
Barley	-0.0856	-0.1004	-0.1546	-0.0621	-0.0216	-0.0556	-0.2164	-0.0476
Sorghum	-0.0231	-0.0302	-0.0514	-0.0189	-0.0115	-0.0177	-0.0763	-0.0135
Dry beans	0.0327	0.2707	0.0633	0.1229	0.0289	0.0910	0.6484	0.0143
Oats	-0.0038	-0.0129	-0.0212	-0.0072	-0.0024	-0.0065	-0.0400	0.0020
Rice	0.0475	0.0412	0.0685	0.0308	0.0127	0.0298	0.0687	0.0328
Sugar beets	0.0729	0.0974	0.1500	0.0521	0.0153	0.0428	0.2164	0.0323
Winter wheat	0.0061	-0.0182	0.0275	-0.0173	-0.0093	-0.0174	-0.0152	-0.0013
Valencia orange	0.0269	-0.0094	0.0358	0.0099	0.0117	0.0159	-0.1277	0.0241
Hay alfalfa	0.0963	0.1017	0.1566	0.0613	0.0205	0.0516	0.1781	0.0506
Grapes (table, raisin)	-0.1073	-0.2144	-0.2557	-0.1163	-0.0344	-0.1043	-0.6588	-0.0489
Grapes (wine)	0.0857	0.0702	0.1271	0.0509	0.0204	0.0495	0.1309	0.0596
Tomatoes (fresh)	-0.0932	-0.0831	-0.2858	-0.0260	-0.0008	-0.0169	-0.2482	-0.0172
Tomatoes (processed)	0.0248	0.0027	0.0408	0.0056	0.0035	0.0069	-0.0161	0.0175
Almonds	0.3701	0.3766	0.6643	0.2418	0.0961	0.2290	0.8993	0.2310
English walnuts	0.0542	0.0133	0.0730	0.0143	0.0068	0.0152	-0.0043	0.0379
Prunes (dried)	0.3839	0.4094	0.7545	0.2173	0.0631	0.1748	0.8152	0.1661
Olives	-0.1317	-0.1362	-0.2981	-0.0759	-0.0229	-0.0695	-0.3973	-0.0642
Potatoes	-0.1076	-0.1128	-0.1922	-0.0658	-0.0214	-0.0550	-0.2075	-0.0524

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 14. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with a 0.25% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	-0.0372	-0.0419	-0.0965	-0.0192	-0.0017	-0.0162	-0.1466	-0.0135
Corn silage	0.0252	0.0377	0.0315	0.0269	0.0110	0.0249	0.0636	0.0178
Barley	-0.1071	-0.1404	-0.1993	-0.0858	-0.0331	-0.0767	-0.3124	-0.0598
Sorghum	-0.0404	-0.0449	-0.0584	-0.0348	-0.0221	-0.0341	-0.0781	-0.0313
Cotton (pima)	-0.0282	-0.0383	-0.0791	-0.0223	-0.0257	-0.0249	-0.1763	-0.0231
Cotton	-0.0792	-0.0966	-0.1743	-0.0618	-0.0425	-0.0594	-0.2488	-0.0496
Dry beans	-0.0914	-0.1359	-0.1563	-0.0751	-0.0266	-0.0612	-0.2668	-0.0472
Oats	-0.1884	-0.1863	-0.4470	-0.1005	-0.0339	-0.0942	-0.6192	-0.0944
Rice	-0.0492	-0.0651	-0.1148	-0.0313	-0.0003	-0.0256	-0.1957	-0.0179
Sugar beets	-0.0614	-0.0472	-0.0894	-0.0401	-0.0288	-0.0399	-0.0645	-0.0456
Winter wheat	-0.0220	-0.0428	-0.0681	-0.0247	-0.0152	-0.0232	-0.1301	-0.0096
Durum wheat	0.0205	0.0330	0.0207	0.0201	-0.0045	0.0164	0.0536	0.0090
Valencia orange	-0.0664	-0.1131	-0.0700	-0.1025	-0.1145	-0.1235	-0.3215	-0.1072
Hay alfalfa	0.0835	0.0890	0.1374	0.0525	0.0158	0.0437	0.1573	0.0424
Grapes (table raisin)	-0.2348	-0.3226	-0.4635	-0.1937	-0.0702	-0.1815	-0.8938	-0.1392
Grapes (wine)	0.1129	0.1044	0.1458	0.0918	0.0706	0.0962	0.1671	0.1017
Tomatoes (fresh)	-0.3742	-0.3566	-0.7157	-0.2170	-0.1115	-0.1877	-0.6641	-0.1915
Tomatoes (processed)	0.0124	-0.0060	0.0262	-0.0048	-0.0090	-0.0057	-0.0267	0.0024
Almonds	0.3701	0.3766	0.6643	0.2418	0.0961	0.2290	0.8993	0.2310
English walnuts	0.0562	0.0301	0.0628	0.0347	0.0321	0.0380	0.0137	0.0517
Prunes (dried)	0.4340	0.4509	0.7967	0.2568	0.0911	0.2125	0.8384	0.2071
Olives	-0.2411	-0.2408	-0.4885	-0.1452	-0.0449	-0.1368	-0.6519	-0.1347
Avocados	0.0099	-0.1612	0.0022	-0.0659	-0.0151	-0.0466	-0.4277	0.0063
Potatoes	-0.1420	-0.1456	-0.2424	-0.0906	-0.0381	-0.0781	-0.2568	-0.0764

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 15. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with a 0.25% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	-0.0424	-0.0225	-0.1310	-0.0062	-0.0084	-0.0056	-0.1146	-0.0160
Corn silage	0.0621	0.0621	0.1025	0.0374	0.0125	0.0312	0.1025	0.0312
Barley	0.1108	0.0948	0.2680	0.0440	0.0094	0.0378	0.3180	0.0486
Oats	-0.0556	-0.0608	-0.0291	-0.0696	-0.0715	-0.0760	-0.0472	-0.0734
Rice	-0.1079	-0.1279	0.0054	-0.1962	-0.2717	-0.2349	-0.0376	-0.2227
Sugar beets	-0.0024	0.0423	-0.0013	0.0276	0.0109	0.0250	0.0933	-0.0023
Winter wheat	-0.0773	-0.0752	-0.0984	-0.0699	-0.0604	-0.0770	-0.1277	-0.0784
Hay alfalfa	0.1367	0.1405	0.2257	0.0835	0.0255	0.0700	0.2492	0.0700
Grapes (wine)	0.3498	0.3151	0.4658	0.2928	0.2538	0.3282	0.5716	0.3527
English walnuts	0.2643	0.1655	0.3574	0.1619	0.1436	0.1810	0.2429	0.2437
Olives	-0.0133	-0.0136	-0.1011	0.0131	0.0243	0.0194	-0.1215	0.0214
Potatoes	-0.1030	-0.1088	-0.1634	-0.0755	-0.0447	-0.0681	-0.1778	-0.0653

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 16. Percent change in yields for the coast region of California,^a by uniform scenario, with a 0.25% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	0.3906	0.3201	0.5398	0.2812	0.2255	0.2699	0.3431	0.2873
Corn silage	-0.3425	-0.3763	-0.4845	-0.3080	-0.2736	-0.2958	-0.5669	-0.2848
Barley	-0.0072	-0.0048	0.0212	-0.0129	-0.0115	-0.0143	0.0326	-0.0150
Dry beans	0.1465	-0.2329	0.2912	-0.0888	0.0065	-0.0551	-0.5985	0.0767
Oats	0.2183	0.1712	0.2762	0.1855	0.2084	0.1911	0.1641	0.2071
Sugar beets	0.2848	0.4662	0.5684	0.2627	0.0846	0.2132	0.8653	0.1213
Winter wheat	-0.1064	-0.0847	-0.0408	-0.1259	-0.1608	-0.1536	-0.0119	-0.1694
Valencia orange	-0.1197	-0.1362	-0.1742	-0.1036	-0.0765	-0.1070	-0.3130	-0.1073
Hay alfalfa	0.1548	0.1624	0.1979	0.1325	0.1024	0.1263	0.2248	0.1241
Grapes (wine)	0.3009	0.2737	0.2769	0.3496	0.4553	0.4471	0.3556	0.4681
Tomatoes (fresh)	0.0769	0.0905	0.0608	0.0522	-0.0110	0.0385	0.0997	0.0354
Tomatoes (processed)	-0.0192	-0.0402	-0.0013	-0.0464	-0.0612	-0.0562	-0.0736	-0.0464
Almonds	0.3701	0.3766	0.6643	0.2418	0.0961	0.2290	0.8993	0.2310
English walnuts	0.3103	0.2481	0.2874	0.3239	0.4136	0.3960	0.2374	0.4351
Prunes (dried)	0.5833	0.6153	0.8854	0.4700	0.3704	0.4404	0.9605	0.4293
Avocados	0.0404	-0.1158	0.0572	-0.0418	-0.0108	-0.0278	-0.3430	0.0188
Potatoes	-0.2116	-0.2179	-0.2776	-0.1826	-0.1498	-0.1758	-0.2961	-0.1727

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 17. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with a 1.0% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								
								Change in yield (% change/100)
Corn grain	0.0335	0.0420	0.0708	0.0284	0.0117	0.0326	0.1642	0.0254
Corn silage	-0.0007	0.0056	-0.0093	0.0053	0.0029	0.0062	0.0105	0.0026
Barley	-0.0500	-0.0586	-0.0902	-0.0409	-0.0169	-0.0433	-0.1685	-0.0371
Sorghum	-0.0132	-0.0172	-0.0293	-0.0122	-0.0088	-0.0136	-0.0584	-0.0104
Dry beans	0.0327	0.2707	0.0633	0.1229	0.0289	0.0910	0.6484	0.0143
Oats	-0.0017	-0.0058	-0.0095	-0.0037	-0.0016	-0.0042	-0.0257	0.0013
Rice	0.0247	0.0214	0.0357	0.0183	0.0092	0.0215	0.0495	0.0236
Sugar beets	0.0557	0.0744	0.1145	0.0429	0.0138	0.0385	0.1947	0.0290
Winter wheat	0.0030	-0.0090	0.0136	-0.0098	-0.0065	-0.0121	-0.0106	-0.0009
Valencia orange	0.0103	-0.0036	0.0136	0.0043	0.0063	0.0086	-0.0691	0.0130
Hay alfalfa	0.0849	0.0896	0.1381	0.0562	0.0196	0.0493	0.1702	0.0483
Grapes (table, raisin)	-0.0496	-0.0991	-0.1183	-0.0615	-0.0226	-0.0683	-0.4318	-0.0321
Grapes (wine)	0.0428	0.0350	0.0634	0.0290	0.0142	0.0345	0.0913	0.0416
Tomatoes (fresh)	-0.0932	-0.0831	-0.2858	-0.0260	-0.0008	-0.0169	-0.2482	-0.0172
Tomatoes (processed)	0.0108	0.0012	0.0178	0.0028	0.0022	0.0043	-0.0100	0.0109
Almonds	0.1910	0.1943	0.3428	0.1443	0.0719	0.1713	0.6726	0.1728
English walnuts	0.0296	0.0072	0.0399	0.0089	0.0050	0.0113	-0.0032	0.0283
Prunes (dried)	0.3839	0.4094	0.7545	0.2173	0.0631	0.1748	0.8152	0.1661
Olives	-0.0619	-0.0640	-0.1401	-0.0408	-0.0152	-0.0461	-0.2639	-0.0427
Potatoes	-0.0951	-0.0998	-0.1701	-0.0605	-0.0204	-0.0526	-0.1985	-0.0501

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 18. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with a 1.0% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop	Change in yield (% change/100)							
Corn grain	-0.0166	-0.0187	-0.0430	-0.0098	-0.0011	-0.0103	-0.0931	-0.0086
Corn silage	0.0148	0.0221	0.0185	0.0178	0.0086	0.0194	0.0497	0.0139
Barley	-0.0637	-0.0835	-0.1186	-0.0575	-0.0261	-0.0605	-0.2462	-0.0472
Sorghum	-0.0233	-0.0259	-0.0337	-0.0227	-0.0171	-0.0264	-0.0603	-0.0242
Cotton (pima)	-0.0108	-0.0146	-0.0302	-0.0096	-0.0139	-0.0135	-0.0957	-0.0125
Cotton	-0.0444	-0.0541	-0.0978	-0.0393	-0.0323	-0.0451	-0.1889	-0.0376
Dry beans	-0.0914	-0.1359	-0.1563	-0.0751	-0.0266	-0.0612	-0.2668	-0.0472
Oats	-0.0816	-0.0806	-0.1935	-0.0497	-0.0209	-0.0582	-0.3826	-0.0583
Rice	-0.0240	-0.0318	-0.0560	-0.0175	-0.0002	-0.0176	-0.1343	-0.0123
Sugar beets	-0.0396	-0.0304	-0.0576	-0.0288	-0.0238	-0.0329	-0.0533	-0.0377
Winter wheat	-0.0111	-0.0217	-0.0345	-0.0143	-0.0108	-0.0165	-0.0923	-0.0068
Durum wheat	0.0109	0.0176	0.0110	0.0122	-0.0033	0.0120	0.0394	0.0066
Valencia orange	-0.0253	-0.0430	-0.0266	-0.0441	-0.0618	-0.0667	-0.1735	-0.0579
Hay alfalfa	0.0744	0.0793	0.1224	0.0485	0.0151	0.0419	0.1510	0.0407
Grapes (table, raisin)	-0.1090	-0.1497	-0.2151	-0.1028	-0.0462	-0.1194	-0.5880	-0.0916
Grapes (wine)	0.0581	0.0537	0.0750	0.0539	0.0504	0.0687	0.1194	0.0727
Tomatoes (fresh)	-0.3742	-0.3566	-0.7157	-0.2170	-0.1115	-0.1877	-0.6641	-0.1915
Tomatoes (processed)	0.0055	-0.0027	0.0117	-0.0025	-0.0057	-0.0036	-0.0170	0.0015
Almonds	0.1910	0.1943	0.3428	0.1443	0.0719	0.1713	0.6726	0.1728
English walnuts	0.0315	0.0169	0.0353	0.0221	0.0244	0.0289	0.0104	0.0392
Prunes (dried)	0.4340	0.4509	0.7967	0.2568	0.0911	0.2125	0.8384	0.2071
Olives	-0.1101	-0.1100	-0.2231	-0.0758	-0.0291	-0.0888	-0.4231	-0.0874
Avocados	0.0099	-0.1612	0.0022	-0.0659	-0.0151	-0.0466	-0.4277	0.0063
Potatoes	-0.1247	-0.1278	-0.2128	-0.0828	-0.0364	-0.0745	-0.2450	-0.0729

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 19. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with a 1.0% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								
								Change in yield (% change/100)
Corn grain	-0.0215	-0.0114	-0.0663	-0.0036	-0.0059	-0.0039	-0.0803	-0.0112
Corn silage	0.0621	0.0621	0.1025	0.0374	0.0125	0.0312	0.1025	0.0312
Barley	0.0530	0.0454	0.1282	0.0240	0.0063	0.0253	0.2131	0.0326
Oats	-0.0316	-0.0345	-0.0165	-0.0447	-0.0544	-0.0579	-0.0360	-0.0559
Rice	-0.0555	-0.0658	0.0028	-0.1149	-0.1928	-0.1666	-0.0267	-0.1580
Sugar beets	-0.0013	0.0223	-0.0007	0.0165	0.0079	0.0181	0.0675	-0.0016
Winter wheat	-0.0355	-0.0345	-0.0452	-0.0366	-0.0391	-0.0498	-0.0826	-0.0507
Hay alfalfa	0.1180	0.1213	0.1948	0.0753	0.0241	0.0662	0.2358	0.0662
Grapes (wine)	0.1519	0.1368	0.2022	0.1449	0.1560	0.2017	0.3513	0.2168
English walnuts	0.1223	0.0766	0.1654	0.0855	0.0935	0.1179	0.1582	0.1588
Olives	-0.0067	-0.0068	-0.0508	0.0075	0.0169	0.0135	-0.0846	0.0149
Potatoes	-0.0925	-0.0976	-0.1467	-0.0700	-0.0430	-0.0655	-0.1709	-0.0627

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 20. Percent change in yields for the coast region of California,^a by uniform scenario, with a 1.0% technological change

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	0.18	0	0.11	0.04	0.09	0.3	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								Change in yield (% change/100)
Corn grain	0.3906	0.3201	0.5398	0.2812	0.2255	0.2699	0.3431	0.2873
Corn silage	-0.3425	-0.3763	-0.4845	-0.3080	-0.2736	-0.2958	-0.5669	-0.2848
Barley	-0.0044	-0.0029	0.0131	-0.0089	-0.0091	-0.0114	0.0260	-0.0119
Dry beans	0.1465	-0.2329	0.2912	-0.0888	0.0065	-0.0551	-0.5985	0.0767
Oats	0.2183	0.1712	0.2762	0.1855	0.2084	0.1911	0.1641	0.2071
Sugar beets	0.2848	0.4662	0.5684	0.2627	0.0846	0.2132	0.8653	0.1213
Winter wheat	-0.0487	-0.0388	-0.0187	-0.0659	-0.1040	-0.0993	-0.0077	-0.1096
Valencia orange	-0.0570	-0.0648	-0.0829	-0.0561	-0.0505	-0.0707	-0.2067	-0.0709
Hay alfalfa	0.1357	0.1424	0.1735	0.1208	0.0974	0.1201	0.2138	0.1180
Grapes (wine)	0.1150	0.1046	0.1058	0.1503	0.2417	0.2374	0.1888	0.2485
Tomatoes (fresh)	0.0769	0.0905	0.0608	0.0522	-0.0110	0.0385	0.0997	0.0354
Tomatoes (processed)	-0.0081	-0.0171	-0.0005	-0.0223	-0.0363	-0.0334	-0.0437	-0.0275
Almonds	0.1910	0.1943	0.3428	0.1443	0.0719	0.1713	0.6726	0.1728
English walnuts	0.1347	0.1077	0.1248	0.1597	0.2513	0.2406	0.1442	0.2644
Prunes (dried)	0.5833	0.6153	0.8854	0.4700	0.3704	0.4404	0.9605	0.4293
Avocados	0.0404	-0.1158	0.0572	-0.0418	-0.0108	-0.0278	-0.3430	0.0188
Potatoes	-0.1890	-0.1946	-0.2479	-0.1687	-0.1435	-0.1684	-0.2836	-0.1654

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 21. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with a 0.25% technological change and CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	0.1019	0.1200	0.1817	0.0832	0.0476	0.0794	0.2787	0.0685
Corn silage	0.0287	0.0408	0.0122	0.0389	0.0340	0.0385	0.0445	0.0336
Barley	0.0744	0.0596	0.0054	0.0979	0.1384	0.1044	-0.0564	0.1124
Sorghum	0.0469	0.0398	0.0186	0.0511	0.0585	0.0523	-0.0063	0.0565
Dry beans	0.2327	0.4707	0.2633	0.3229	0.2289	0.2910	0.8484	0.2143
Oats	0.1562	0.1471	0.1388	0.1528	0.1576	0.1535	0.1200	0.1620
Rice	0.1975	0.1912	0.2185	0.1808	0.1627	0.1798	0.2187	0.1828
Sugar beets	0.2729	0.2974	0.3500	0.2521	0.2153	0.2428	0.4164	0.2323
Winter wheat	0.1661	0.1418	0.1875	0.1427	0.1507	0.1426	0.1448	0.1587
Valencia orange	0.3469	0.3106	0.3558	0.3299	0.3317	0.3359	0.1923	0.3441
Hay alfalfa	0.1963	0.2017	0.2566	0.1613	0.1205	0.1516	0.2781	0.1506
Grapes (table, raisin)	0.1427	0.0356	-0.0057	0.1337	0.2156	0.1457	-0.4088	0.2011
Grapes (wine)	0.3357	0.3202	0.3771	0.3009	0.2704	0.2995	0.3809	0.3096
Tomatoes (fresh)	0.1568	0.1669	-0.0358	0.2240	0.2492	0.2331	0.0018	0.2328
Tomatoes (processed)	0.2748	0.2527	0.2908	0.2556	0.2535	0.2569	0.2339	0.2675
Almonds	0.6201	0.6266	0.9143	0.4918	0.3461	0.4790	1.1493	0.4810
English walnuts	0.3042	0.2633	0.3230	0.2643	0.2568	0.2652	0.2457	0.2879
Prunes (dried)	0.6339	0.6594	1.0045	0.4673	0.3131	0.4248	1.0652	0.4161
Olives	0.1183	0.1138	-0.0481	0.1741	0.2271	0.1805	-0.1473	0.1858
Potatoes	-0.0476	-0.0528	-0.1322	-0.0058	0.0386	0.0050	-0.1475	0.0076

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 22. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with a 0.25% technological change and CO₂ fertilizer effects

	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario
	1	2	3	4	5	6	7	8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop	Change in yield (% change/100)							
Corn grain	-0.0072	-0.0119	-0.0665	0.0108	0.0283	0.0138	-0.1166	0.0165
Corn silage	0.0552	0.0677	0.0615	0.0569	0.0410	0.0549	0.0936	0.0478
Barley	0.0529	0.0196	-0.0393	0.0742	0.1269	0.0833	-0.1524	0.1002
Sorghum	0.0296	0.0251	0.0116	0.0352	0.0479	0.0359	-0.0081	0.0387
Cotton (pima)	0.1318	0.1217	0.0809	0.1377	0.1343	0.1351	-0.0163	0.1369
Cotton	0.0808	0.0634	-0.0143	0.0982	0.1175	0.1006	-0.0888	0.1104
Dry beans	0.1086	0.0641	0.0437	0.1249	0.1734	0.1388	-0.0668	0.1528
Oats	-0.0284	-0.0263	-0.2870	0.0595	0.1261	0.0658	-0.4592	0.0656
Rice	0.1008	0.0849	0.0352	0.1187	0.1497	0.1244	-0.0457	0.1321
Sugar beets	0.1386	0.1528	0.1106	0.1599	0.1712	0.1601	0.1355	0.1544
Winter wheat	0.1380	0.1172	0.0919	0.1353	0.1448	0.1368	0.0299	0.1504
Durum wheat	0.1805	0.1930	0.1807	0.1801	0.1555	0.1764	0.2136	0.1690
Valencia orange	0.2536	0.2069	0.2500	0.2175	0.2055	0.1965	-0.0015	0.2128
Hay alfalfa	0.1835	0.1890	0.2374	0.1525	0.1158	0.1437	0.2573	0.1424
Grapes (table, raisin)	0.0152	-0.0726	-0.2135	0.0563	0.1798	0.0685	-0.6438	0.1108
Grapes (wine)	0.3629	0.3544	0.3958	0.3418	0.3206	0.3462	0.4171	0.3517
Tomatoes (fresh)	-0.1242	-0.1066	-0.4657	0.0330	0.1385	0.0623	-0.4141	0.0585
Tomatoes (processed)	0.2624	0.2440	0.2762	0.2452	0.2410	0.2443	0.2233	0.2524
Almonds	0.6201	0.6266	0.9143	0.4918	0.3461	0.4790	1.1493	0.4810
English walnuts	0.3062	0.2801	0.3128	0.2847	0.2821	0.2880	0.2637	0.3017
Prunes (dried)	0.6840	0.7009	1.0467	0.5068	0.3411	0.4625	1.0884	0.4571
Olives	0.0089	0.0092	-0.2385	0.1048	0.2051	0.1132	-0.4019	0.1153
Avocados	0.2599	0.0888	0.2522	0.1841	0.2349	0.2034	-0.1777	0.2563
Potatoes	-0.0820	-0.0856	-0.1824	-0.0306	0.0219	-0.0181	-0.1968	-0.0164

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 23. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with a 0.25% technological change and CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	-0.0124	0.0075	-0.1010	0.0238	0.0216	0.0244	-0.0846	0.0140
Corn silage	0.0921	0.0921	0.1325	0.0674	0.0425	0.0612	0.1325	0.0612
Barley	0.2708	0.2548	0.4280	0.2040	0.1694	0.1978	0.4780	0.2086
Oats	0.1044	0.0992	0.1309	0.0904	0.0885	0.0840	0.1128	0.0866
Rice	0.0421	0.0221	0.1554	-0.0462	-0.1217	-0.0849	0.1124	-0.0727
Sugar beets	0.1976	0.2423	0.1987	0.2276	0.2109	0.2250	0.2933	0.1977
Winter wheat	0.0827	0.0848	0.0616	0.0901	0.0996	0.0830	0.0323	0.0816
Hay alfalfa	0.2367	0.2405	0.3257	0.1835	0.1255	0.1700	0.3492	0.1700
Grapes (wine)	0.5998	0.5651	0.7158	0.5428	0.5038	0.5782	0.8216	0.6027
English walnuts	0.5143	0.4155	0.6074	0.4119	0.3936	0.4310	0.4929	0.4937
Olives	0.2367	0.2364	0.1489	0.2631	0.2743	0.2694	0.1285	0.2714
Potatoes	-0.0430	-0.0488	-0.1034	-0.0155	0.0153	-0.0081	-0.1178	-0.0053

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 24. Percent change in yields for the coast region of California,^a by uniform scenario, with a 0.25% technological change and CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3.00	3.00	5.00	1.80	0.60	1.50	5.00	1.50
Temperature change (°F)	5.40	5.40	9.00	3.24	1.08	2.70	9.00	2.70
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Crop								
								Change in yield (% change/100)
Corn grain	0.4206	0.3501	0.5698	0.3112	0.2555	0.2999	0.3731	0.3173
Corn silage	-0.3125	-0.3463	-0.4545	-0.2780	-0.2436	-0.2658	-0.5369	-0.2548
Barley	0.1528	0.1552	0.1812	0.1471	0.1485	0.1457	0.1926	0.1450
Dry beans	0.3465	-0.0329	0.4912	0.1112	0.2065	0.1449	-0.3985	0.2767
Oats	0.3783	0.3312	0.4362	0.3455	0.3684	0.3511	0.3241	0.3671
Sugar beets	0.4848	0.6662	0.7684	0.4627	0.2846	0.4132	1.0653	0.3213
Winter wheat	0.0536	0.0753	0.1192	0.0341	-0.0008	0.0064	0.1481	-0.0094
Valencia orange	0.2003	0.1838	0.1458	0.2164	0.2435	0.2130	0.0070	0.2127
Hay alfalfa	0.2548	0.2624	0.2979	0.2325	0.2024	0.2263	0.3248	0.2241
Grapes (wine)	0.5509	0.5237	0.5269	0.5996	0.7053	0.6971	0.6056	0.7181
Tomatoes (fresh)	0.3269	0.3405	0.3108	0.3022	0.2390	0.2885	0.3497	0.2854
Tomatoes (processed)	0.2308	0.2098	0.2487	0.2036	0.1888	0.1938	0.1764	0.2036
Almonds	0.6201	0.6266	0.9143	0.4918	0.3461	0.4790	1.1493	0.4810
English walnuts	0.5603	0.4981	0.5374	0.5739	0.6636	0.6460	0.4874	0.6851
Prunes (dried)	0.8333	0.8653	1.1354	0.7200	0.6204	0.6904	1.2105	0.6793
Avocados	0.2904	0.1342	0.3072	0.2082	0.2392	0.2222	-0.0930	0.2688
Potatoes	-0.1516	-0.1579	-0.2176	-0.1226	-0.0898	-0.1158	-0.2361	-0.1127

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 25. Percent change in yields for the Sacramento and delta regions of California,^a by uniform scenario, with a 1.0% technological change and CO₂ fertilizer effects

	Scenario							
	1	2	3	4	5	6	7	8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								
								Change in yield (% change/100)
Corn grain	0.0635	0.0720	0.1008	0.0584	0.0417	0.0626	0.1942	0.0554
Corn silage	0.0293	0.0356	0.0207	0.0353	0.0329	0.0362	0.0405	0.0326
Barley	0.1100	0.1014	0.0698	0.1191	0.1431	0.1167	-0.0085	0.1229
Sorghum	0.0568	0.0528	0.0407	0.0578	0.0612	0.0564	0.0116	0.0596
Dry beans	0.2327	0.4707	0.2633	0.3229	0.2289	0.2910	0.8484	0.2143
Oats	0.1583	0.1542	0.1505	0.1563	0.1584	0.1558	0.1343	0.1613
Rice	0.1747	0.1714	0.1857	0.1683	0.1592	0.1715	0.1995	0.1736
Sugar beets	0.2557	0.2744	0.3145	0.2429	0.2138	0.2385	0.3947	0.2290
Winter wheat	0.1630	0.1510	0.1736	0.1502	0.1535	0.1479	0.1494	0.1591
Valencia orange	0.3303	0.3164	0.3336	0.3243	0.3263	0.3286	0.2509	0.3330
Hay alfalfa	0.1849	0.1896	0.2381	0.1562	0.1196	0.1493	0.2702	0.1483
Grapes (table, raisin)	0.2004	0.1509	0.1317	0.1885	0.2274	0.1817	-0.1818	0.2179
Grapes (wine)	0.2928	0.2850	0.3134	0.2790	0.2642	0.2845	0.3413	0.2916
Tomatoes (fresh)	0.1568	0.1669	-0.0358	0.2240	0.2492	0.2331	0.0018	0.2328
Tomatoes (processed)	0.2608	0.2512	0.2678	0.2528	0.2522	0.2543	0.2400	0.2609
Almonds	0.4410	0.4443	0.5928	0.3943	0.3219	0.4213	0.9226	0.4228
English walnuts	0.2796	0.2572	0.2899	0.2589	0.2550	0.2613	0.2468	0.2783
Prunes (dried)	0.6339	0.6594	1.0045	0.4673	0.3131	0.4248	1.0652	0.4161
Olives	0.1881	0.1860	0.1099	0.2092	0.2348	0.2039	-0.0139	0.2073
Potatoes	-0.0351	-0.0398	-0.1101	-0.0005	0.0396	0.0074	-0.1385	0.0099

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 26. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by uniform scenario, with a 1.0% technological change and CO₂ fertilizer effects

	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario
	1	2	3	4	5	6	7	8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop	Change in yield (% change/100)							
Corn grain	0.0134	0.0113	-0.0130	0.0202	0.0289	0.0197	-0.0631	0.0214
Corn silage	0.0448	0.0521	0.0485	0.0478	0.0386	0.0494	0.0797	0.0439
Barley	0.0963	0.0765	0.0414	0.1025	0.1339	0.0995	-0.0862	0.1128
Sorghum	0.0467	0.0441	0.0363	0.0473	0.0529	0.0436	0.0097	0.0458
Cotton (pima)	0.1492	0.1454	0.1298	0.1504	0.1461	0.1465	0.0643	0.1475
Cotton	0.1156	0.1059	0.0622	0.1207	0.1277	0.1149	-0.0289	0.1224
Dry beans	0.1086	0.0641	0.0437	0.1249	0.1734	0.1388	-0.0668	0.1528
Oats	0.0784	0.0794	-0.0335	0.1103	0.1391	0.1018	-0.2226	0.1017
Rice	0.1260	0.1182	0.0940	0.1325	0.1498	0.1324	0.0157	0.1377
Sugar beets	0.1604	0.1696	0.1424	0.1712	0.1762	0.1671	0.1467	0.1623
Winter wheat	0.1489	0.1383	0.1255	0.1457	0.1492	0.1435	0.0677	0.1532
Durum wheat	0.1709	0.1776	0.1710	0.1722	0.1567	0.1720	0.1994	0.1666
Valencia orange	0.2947	0.2770	0.2934	0.2759	0.2582	0.2533	0.1465	0.2621
Hay alfalfa	0.1744	0.1793	0.2224	0.1485	0.1151	0.1419	0.2510	0.1407
Grapes (table, raisin)	0.1410	0.1003	0.0349	0.1472	0.2038	0.1306	-0.3380	0.1584
Grapes (wine)	0.3081	0.3037	0.3250	0.3039	0.3004	0.3187	0.3694	0.3227
Tomatoes (fresh)	-0.1242	-0.1066	-0.4657	0.0330	0.1385	0.0623	-0.4141	0.0585
Tomatoes (processed)	0.2555	0.2473	0.2617	0.2475	0.2443	0.2464	0.2330	0.2515
Almonds	0.4410	0.4443	0.5928	0.3943	0.3219	0.4213	0.9226	0.4228
English walnuts	0.2815	0.2669	0.2853	0.2721	0.2744	0.2789	0.2604	0.2892
Prunes (dried)	0.6840	0.7009	1.0467	0.5068	0.3411	0.4625	1.0884	0.4571
Olives	0.1399	0.1400	0.0269	0.1742	0.2209	0.1612	-0.1731	0.1626
Avocados	0.2599	0.0888	0.2522	0.1841	0.2349	0.2034	-0.1777	0.2563
Potatoes	-0.0647	-0.0678	-0.1528	-0.0228	0.0236	-0.0145	-0.1850	-0.0129

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 27. Percent change in yields for the northeast and mountain regions of California,^a by uniform scenario, with a 1.0% technological change and CO₂ fertilizer effects

	Scenario							
	1	2	3	4	5	6	7	8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	18	0	11	4	9	30	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								
								Change in yield (% change/100)
Corn grain	0.0085	0.0186	-0.0363	0.0264	0.0241	0.0261	-0.0503	0.0188
Corn silage	0.0921	0.0921	0.1325	0.0674	0.0425	0.0612	0.1325	0.0612
Barley	0.2130	0.2054	0.2882	0.1840	0.1663	0.1853	0.3731	0.1926
Oats	0.1284	0.1255	0.1435	0.1153	0.1056	0.1021	0.1240	0.1041
Rice	0.0945	0.0842	0.1528	0.0351	-0.0428	-0.0166	0.1233	-0.0080
Sugar beets	0.1987	0.2223	0.1993	0.2165	0.2079	0.2181	0.2675	0.1984
Winter wheat	0.1245	0.1255	0.1148	0.1234	0.1209	0.1102	0.0774	0.1093
Hay alfalfa	0.2180	0.2213	0.2948	0.1753	0.1241	0.1662	0.3358	0.1662
Grapes (wine)	0.4019	0.3868	0.4522	0.3949	0.4060	0.4517	0.6013	0.4668
English walnuts	0.3723	0.3266	0.4154	0.3355	0.3435	0.3679	0.4082	0.4088
Olives	0.2433	0.2432	0.1992	0.2575	0.2669	0.2635	0.1654	0.2649
Potatoes	-0.0325	-0.0376	-0.0867	-0.0100	0.0170	-0.0055	-0.1109	-0.0027

a. This region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 28. Percent change in yields for the coast region of California,^a by uniform scenario, with a 1.0% technological change and CO₂ fertilizer effects

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Temperature change (°C)	3	3	5	1.8	0.6	1.5	5	1.5
Temperature change (°F)	5.4	5.4	9	3.24	1.08	2.7	9	2.7
Precipitation change (%)	0	0.18	0	0.11	0.04	0.09	0.3	0
Year forecasted	2100	2100	2100	2060	2020	2020	2020	2020
Technological change	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Crop								
								Change in yield (% change/100)
Corn grain	0.4206	0.3501	0.5698	0.3112	0.2555	0.2999	0.3731	0.3173
Corn silage	-0.3125	-0.3463	-0.4545	-0.2780	-0.2436	-0.2658	-0.5369	-0.2548
Barley	0.1556	0.1571	0.1731	0.1511	0.1509	0.1486	0.1860	0.1481
Dry beans	0.3465	-0.0329	0.4912	0.1112	0.2065	0.1449	-0.3985	0.2767
Oats	0.3783	0.3312	0.4362	0.3455	0.3684	0.3511	0.3241	0.3671
Sugar beets	0.4848	0.6662	0.7684	0.4627	0.2846	0.4132	1.0653	0.3213
Winter wheat	0.1113	0.1212	0.1413	0.0941	0.0560	0.0607	0.1523	0.0504
Valencia orange	0.2630	0.2552	0.2371	0.2639	0.2695	0.2493	0.1133	0.2491
Hay alfalfa	0.2357	0.2424	0.2735	0.2208	0.1974	0.2201	0.3138	0.2180
Grapes (wine)	0.3650	0.3546	0.3558	0.4003	0.4917	0.4874	0.4388	0.4985
Tomatoes (fresh)	0.3269	0.3405	0.3108	0.3022	0.2390	0.2885	0.3497	0.2854
Tomatoes (processed)	0.2419	0.2329	0.2495	0.2277	0.2137	0.2166	0.2063	0.2225
Almonds	0.4410	0.4443	0.5928	0.3943	0.3219	0.4213	0.9226	0.4228
English walnuts	0.3847	0.3577	0.3748	0.4097	0.5013	0.4906	0.3942	0.5144
Prunes (dried)	0.8333	0.8653	1.1354	0.7200	0.6204	0.6904	1.2105	0.6793
Avocados	0.2904	0.1342	0.3072	0.2082	0.2392	0.2222	-0.0930	0.2688
Potatoes	-0.1290	-0.1346	-0.1879	-0.1087	-0.0835	-0.1084	-0.2236	-0.1054

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 29. Scenario assumptions for percent change in irrigation water use, when temperature and precipitation change monthly

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Sacramento and delta						
<i>Change in temperature (°F)</i>						
Mar	1.028	2.918	5.872	3.031	3.946	5.294
Apr	0.614	2.831	3.389	2.504	4.086	6.268
May	-0.139	1.863	4.720	1.582	2.826	4.358
Jun	0.560	1.985	3.967	2.203	4.322	5.751
Jul	0.871	3.744	4.644	3.110	5.083	7.198
Aug	1.001	3.289	3.838	2.183	4.883	6.863
Sep	1.627	3.758	4.860	2.929	5.213	6.784
<i>Change in precipitation (inches)</i>						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
San Joaquin Valley and desert						
<i>Change in temperature (°F)</i>						
Mar	1.793	3.397	6.446	2.632	3.719	4.556
Apr	1.046	3.481	4.801	2.102	3.922	5.677
May	-0.362	1.238	4.102	1.240	2.000	3.677
Jun	-0.034	2.032	4.120	2.486	4.316	5.747
Jul	0.533	3.398	4.619	2.898	4.828	6.809
Aug	1.730	3.355	4.757	1.984	4.523	6.718
Sep	1.976	4.255	5.722	3.512	5.288	7.724
<i>Change in precipitation (inches)</i>						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088

Table 29. Scenario assumptions for percent change in irrigation water use, when temperature and precipitation change monthly (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Northeast and mountain						
<i>Change in temperature (°F)</i>						
Mar	0.819	2.664	5.540	3.433	4.028	5.575
Apr	0.653	2.624	3.231	2.680	4.417	6.754
May	-0.011	2.160	5.274	1.354	2.534	3.967
Jun	0.740	2.142	4.451	2.482	4.747	6.286
Jul	0.922	4.126	5.029	3.422	5.686	7.749
Aug	1.265	3.686	4.262	2.291	5.593	7.585
Sep	1.975	4.244	5.346	3.269	5.618	7.070
<i>Change in precipitation (inches)</i>						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Coast						
<i>Change in temperature (°F)</i>						
Mar	1.580	3.292	6.221	2.49	3.841	4.80
Apr	0.810	3.164	4.387	2.21	3.847	5.56
May	-0.506	0.994	3.616	1.60	2.459	4.19
Jun	0.063	1.867	3.793	2.33	3.935	5.36
Jul	0.463	2.898	4.149	2.67	4.329	6.33
Aug	1.352	2.849	4.016	2.06	4.221	6.38
Sep	1.645	3.775	5.056	3.24	5.017	7.38
<i>Change in precipitation (inches)</i>						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076

Table 30. Percent change in irrigation water use, by scenario, when temperature and precipitation changes monthly, accounting for CO₂ effects^a

Region	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in irrigation water use (% change/100)						
Sacramento and delta ^b	-0.016	0.057	0.171	0.100	0.167	0.194
San Joaquin Valley and desert ^c	-0.056	0.043	0.071	0.099	0.138	0.152
Northeast and mountain ^d	-0.091	0.000	0.088	0.104	0.151	0.163
Coast ^e	-0.034	0.111	0.185	0.194	0.267	0.319

a. CO₂ effects on water use are based on data from Adams et al. (1999a).

b. Sacramento and delta region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

c. San Joaquin Valley and desert region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

d. Northeast and mountain region includes Calaveras, El Dorado, Lassen, Maraposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

e. Coast region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 31. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, when temperature and precipitation change by month, and no CO₂ fertilizer effect

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.028	2.918	5.872	3.03	3.946	5.29
Apr	0.614	2.831	3.389	2.50	4.086	6.27
May	-0.139	1.863	4.720	1.58	2.826	4.36
Jun	0.560	1.985	3.967	2.20	4.322	5.75
Jul	0.871	3.744	4.644	3.11	5.083	7.20
Aug	1.001	3.289	3.838	2.18	4.883	6.86
Sep	1.627	3.758	4.860	2.93	5.213	6.78
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.141	-0.936	-1.501	3.040	3.371	2.950
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0094	0.0489	0.0693	0.1032	0.1504	0.2024
Corn silage	0.0264	0.0229	0.0427	0.0179	0.0249	-0.0175
Barley	-0.0376	-0.0829	-0.0811	-0.1628	-0.1910	-0.2169
Sorghum	0.0195	0.0345	0.0100	-0.0547	-0.0458	-0.0257
Dry beans	0.0070	0.0347	0.0498	0.0376	0.0638	0.0479
Oats	-0.0277	0.0437	0.0650	-0.1213	-0.1315	-0.1102
Rice	0.0321	0.0720	0.0554	0.0187	0.0763	0.0776
Sugar beets	0.0083	0.0026	0.0438	0.0248	0.0396	0.1117
Winter wheat	-0.0089	0.0287	0.0998	-0.0596	-0.0240	-0.0007
Valencia orange	0.1667	0.1993	0.0390	0.4265	0.1615	0.2954
Hay alfalfa	0.0049	0.0682	0.1112	0.0473	0.0848	0.1067
Grapes (table, raisin)	0.1947	0.1444	0.0709	-0.2478	-0.1874	-0.3160
Grapes (wine)	0.0039	0.1326	0.0939	-0.0178	0.0648	0.1252
Tomatoes (fresh)	-0.0096	-0.0302	-0.0442	-0.0019	-0.1034	-0.1904

Table 31. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, when temperature and precipitation change by month, and no CO₂ fertilizer effect (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Tomatoes (processed)	0.0287	0.0214	0.0020	-0.0323	0.0184	0.0630
Almonds	0.1455	0.3844	0.5846	0.2247	0.3914	0.5418
English walnuts	-0.0291	0.1079	0.0672	-0.1260	-0.0779	0.0189
Prunes (dried)	0.0424	0.1942	0.3267	0.1346	0.3012	0.4879
Olives	-0.0073	-0.0007	-0.1037	-0.2306	-0.2979	-0.3760
Potatoes	-0.0161	-0.0361	-0.0988	-0.0520	-0.0885	-0.1284

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 32. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, and no CO₂ fertilizer effect

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.63	3.719	4.56
Apr	1.046	3.481	4.801	2.10	3.922	5.68
May	-0.362	1.238	4.102	1.24	2.000	3.68
Jun	-0.034	2.032	4.120	2.49	4.316	5.75
Jul	0.533	3.398	4.619	2.90	4.828	6.81
Aug	1.730	3.355	4.757	1.98	4.523	6.72
Sep	1.976	4.255	5.722	3.51	5.288	7.72
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0029	-0.0166	-0.0627	-0.0384	-0.0340	-0.0831
Corn silage	0.0327	0.0412	0.0823	0.1087	0.1024	0.1092
Barley	-0.0245	-0.0944	-0.1535	-0.1683	-0.1638	-0.1867
Sorghum	-0.0282	-0.0654	-0.0634	-0.1000	-0.0823	-0.0933
Cotton (pima)	-0.0235	-0.0144	-0.0805	0.1707	0.0401	0.1526
Cotton	-0.0312	-0.0546	-0.0833	-0.1222	-0.1670	-0.1925
Dry beans	-0.0821	-0.1359	-0.2060	-0.1141	-0.0757	-0.0836
Oats	-0.0574	-0.1633	-0.3213	-0.1427	-0.2135	-0.4112
Rice	0.0092	-0.0279	-0.0596	-0.0147	-0.0134	-0.0671
Sugar beets	-0.0236	-0.0482	-0.0290	-0.0341	-0.1003	-0.1413
Winter wheat	-0.0416	-0.0429	-0.0459	-0.1101	-0.1253	-0.1859
Durum wheat	-0.0402	-0.0439	0.0019	0.0937	0.0736	0.1239
Valencia orange	-0.0522	-0.1101	-0.2981	0.1942	0.1000	0.2245
Hay alfalfa	0.0183	0.0776	0.1258	0.0331	0.0563	0.0600

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Table 32. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, and no CO₂ fertilizer effect (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Grapes (table, raisin)	0.1162	-0.1679	-0.0926	-0.2039	-0.5898	-0.6193
Grapes (wine)	0.0284	0.1013	0.0923	0.0068	0.0356	0.0889
Tomatoes (fresh)	-0.0439	-0.0974	-0.1870	-0.2276	-0.3253	-0.5197
Tomatoes (processed)	0.0025	-0.0240	-0.0219	-0.0571	-0.0152	0.0645
Almonds	0.1881	0.4223	0.6613	0.3234	0.3507	0.5606
English walnuts	0.0344	0.0996	0.0571	-0.0986	-0.0127	0.0107
Prunes (dried)	0.1362	0.3041	0.4610	0.1802	0.3496	0.5275
Olives	-0.0648	-0.2578	-0.3041	-0.3666	-0.6092	-0.8001
Avocados	-0.0007	-0.1474	-0.0565	-0.1221	-0.1770	-0.1267
Potatoes	-0.0619	-0.0968	-0.1564	-0.0803	-0.1403	-0.1776

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 33. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, and no CO₂ fertilizer effect

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.819	2.664	5.540	3.43	4.028	5.57
Apr	0.653	2.624	3.231	2.68	4.417	6.75
May	-0.011	2.160	5.274	1.35	2.534	3.97
Jun	0.740	2.142	4.451	2.48	4.747	6.29
Jul	0.922	4.126	5.029	3.42	5.686	7.75
Aug	1.265	3.686	4.262	2.29	5.593	7.59
Sep	1.975	4.244	5.346	3.27	5.618	7.07
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	-0.0013	0.0511	0.1149	0.0604	0.0531	-0.1007
Corn silage	-0.0953	-0.0889	0.1688	-0.0394	-0.0776	-0.1220
Barley	-0.0189	0.0980	0.1743	0.0811	0.1822	0.2703
Oats	-0.0355	0.0732	0.0372	-0.0933	-0.0651	-0.0477
Rice	-0.2849	-0.2096	-0.1700	-0.2960	-0.1715	-0.0873
Sugar beets	-0.1190	-0.1407	-0.3440	0.6972	1.1079	0.7831
Winter wheat	-0.0646	-0.1007	-0.0820	-0.1505	-0.1969	-0.1764
Hay alfalfa	-0.0185	0.1218	0.2073	0.0964	0.1462	0.1539
Grapes (wine)	0.3438	0.6134	0.6493	0.3624	0.5510	0.6733
English walnuts	0.1226	0.4532	0.4985	0.0805	0.2381	0.3628
Potatoes	-0.0154	-0.0545	-0.0807	-0.0512	-0.0969	-0.1201

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 34. Percent change in yields for the coast region of California,^a by GCM Scenario, when temperature and precipitation changes by month, and no CO₂ fertilizer effect

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.49	3.841	4.80
Apr	0.810	3.164	4.387	2.21	3.847	5.56
May	-0.506	0.994	3.616	1.60	2.459	4.19
Jun	0.063	1.867	3.793	2.33	3.935	5.36
Jul	0.463	2.898	4.149	2.67	4.329	6.33
Aug	1.352	2.849	4.016	2.06	4.221	6.38
Sep	1.645	3.775	5.056	3.24	5.017	7.38
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0871	0.1683	0.1916	0.3340	0.5098	0.6672
Corn silage	-0.2525	-0.2976	-0.3308	-0.2332	-0.3194	-0.3302
Barley	0.0077	-0.0154	-0.0096	-0.0435	-0.0240	-0.0046
Dry beans	0.0111	0.0583	0.0570	0.0907	0.1498	0.1884
Oats	0.2117	0.1792	0.1687	0.1136	0.1384	0.2245
Sugar beets	0.0442	0.1084	0.2425	0.2394	0.3101	0.3017
Winter wheat	-0.2001	-0.1228	-0.1090	-0.1218	-0.0719	0.0003
Valencia orange	-0.0823	-0.0994	-0.2045	0.1543	-0.0341	-0.0348
Hay alfalfa	0.1186	0.1532	0.1923	0.1019	0.1369	0.1403
Grapes (wine)	0.6475	0.7022	0.6007	0.5040	0.5251	0.5129
Tomatoes (fresh)	0.0030	0.0939	0.1304	0.0554	0.0463	0.0616
Tomatoes (processed)	-0.0879	-0.0944	-0.0735	-0.1174	-0.0753	-0.0277
Almonds	0.1558	0.3561	0.5544	0.2323	0.3080	0.5100
English walnuts	0.5668	0.6174	0.5817	0.2277	0.2784	0.2587
Prunes (dried)	0.3313	0.4002	0.5842	0.3599	0.4135	0.5331

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Table 34. Percent change in yields for the coast region of California,^a by GCM Scenario, when temperature and precipitation changes by month, and no CO₂ fertilizer effect (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Avocados	0.0087	-0.0247	0.0103	-0.0339	-0.0617	-0.0324
Potatoes	-0.1705	-0.1871	-0.2183	-0.1681	-0.2122	-0.2425

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 35. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, when temperature and precipitation change by month, with CO₂ fertilizer effects

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.028	2.918	5.872	3.031	3.946	5.294
Apr	0.614	2.831	3.389	2.504	4.086	6.268
May	-0.139	1.863	4.720	1.582	2.826	4.358
Jun	0.560	1.985	3.967	2.203	4.322	5.751
Jul	0.871	3.744	4.644	3.110	5.083	7.198
Aug	1.001	3.289	3.838	2.183	4.883	6.863
Sep	1.627	3.758	4.860	2.929	5.213	6.784
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.141	-0.936	-1.501	3.040	3.371	2.950
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0394	0.0789	0.0993	0.1332	0.1804	0.2324
Corn silage	0.0564	0.0529	0.0727	0.0479	0.0549	0.0125
Barley	0.1224	0.0771	0.0789	-0.0028	-0.0310	-0.0569
Sorghum	0.0895	0.1045	0.0800	0.0153	0.0242	0.0443
Dry beans	0.2070	0.2347	0.2498	0.2376	0.2638	0.2479
Oats	0.1323	0.2037	0.2250	0.0387	0.0285	0.0498
Rice	0.1821	0.2220	0.2054	0.1687	0.2263	0.2276
Sugar beets	0.2083	0.2026	0.2438	0.2248	0.2396	0.3117
Winter wheat	0.1511	0.1887	0.2598	0.1004	0.1360	0.1593
Valencia orange	0.4867	0.5193	0.3590	0.7465	0.4815	0.6154
Hay alfalfa	0.1049	0.1682	0.2112	0.1473	0.1848	0.2067
Grapes (table, raisin)	0.4447	0.3944	0.3209	0.0022	0.0626	-0.0660
Grapes (wine)	0.2539	0.3826	0.3439	0.2322	0.3148	0.3752
Tomatoes (fresh)	0.2404	0.2198	0.2058	0.2481	0.1466	0.0596

Table 35. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, when temperature and precipitation change by month, with CO₂ fertilizer effects (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Tomatoes (processed)	0.2787	0.2714	0.2520	0.2177	0.2684	0.3130
Almonds	0.3955	0.6344	0.8346	0.4747	0.6414	0.7918
English walnuts	0.2209	0.3579	0.3172	0.1240	0.1721	0.2689
Prunes (dried)	0.2924	0.4442	0.5767	0.3846	0.5512	0.7379
Olives	0.2427	0.2493	0.1463	0.0194	-0.0479	-0.1260
Potatoes	0.0439	0.0239	-0.0388	0.0080	-0.0285	-0.0684

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 36. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, with CO₂ fertilizer effects

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.632	3.719	4.556
Apr	1.046	3.481	4.801	2.102	3.922	5.677
May	-0.362	1.238	4.102	1.240	2.000	3.677
Jun	-0.034	2.032	4.120	2.486	4.316	5.747
Jul	0.533	3.398	4.619	2.898	4.828	6.809
Aug	1.730	3.355	4.757	1.984	4.523	6.718
Sep	1.976	4.255	5.722	3.512	5.288	7.724
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0329	0.0134	-0.0327	-0.0084	-0.0040	-0.0531
Corn silage	0.0627	0.0712	0.1123	0.1387	0.1324	0.1392
Barley	0.1355	0.0656	0.0065	-0.0083	-0.0038	-0.0267
Sorghum	0.0418	0.0046	0.0066	-0.0300	-0.0123	-0.0233
Cotton (pima)	0.1365	0.1456	0.0795	0.3307	0.2001	0.3126
Cotton	0.1288	0.1054	0.0767	0.0378	-0.0070	-0.0325
Dry beans	0.1179	0.0641	-0.0060	0.0859	0.1243	0.1164
Oats	0.1026	-0.0033	-0.1613	0.0173	-0.0535	-0.2512
Rice	0.1592	0.1221	0.0904	0.1353	0.1366	0.0829
Sugar beets	0.1764	0.1518	0.1710	0.1659	0.0997	0.0587
Winter wheat	0.1184	0.1171	0.1141	0.0499	0.0347	-0.0259
Durum wheat	0.1198	0.1161	0.1619	0.2537	0.2336	0.2839
Valencia orange	0.2678	0.2099	0.0219	0.5142	0.4200	0.5445
Hay alfalfa	0.1183	0.1776	0.2258	0.1331	0.1563	0.1600

Table 36. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, with CO₂ fertilizer effects (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Grapes (table, raisin)	0.3662	0.0821	0.1574	0.0461	-0.3398	-0.3693
Grapes (wine)	0.2784	0.3513	0.3423	0.2568	0.2856	0.3389
Tomatoes (fresh)	0.2061	0.1526	0.0630	0.0224	-0.0753	-0.2697
Tomatoes (processed)	0.2525	0.2260	0.2281	0.1929	0.2348	0.3145
Almonds	0.4381	0.6723	0.9113	0.5734	0.6007	0.8106
English walnuts	0.2844	0.3496	0.3071	0.1514	0.2373	0.2607
Prunes (dried)	0.3862	0.5541	0.7110	0.4302	0.5996	0.7775
Olives	0.1852	-0.0078	-0.0541	-0.1166	-0.3592	-0.5501
Avocados	0.2493	0.1026	0.1935	0.1279	0.0730	0.1233
Potatoes	-0.0019	-0.0368	-0.0964	-0.0203	-0.0803	-0.1176

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 37. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, when temperature and precipitation changes by month, with CO₂ fertilizer effects

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.819	2.664	5.540	3.433	4.028	5.575
Apr	0.653	2.624	3.231	2.680	4.417	6.754
May	-0.011	2.160	5.274	1.354	2.534	3.967
Jun	0.740	2.142	4.451	2.482	4.747	6.286
Jul	0.922	4.126	5.029	3.422	5.686	7.749
Aug	1.265	3.686	4.262	2.291	5.593	7.585
Sep	1.975	4.244	5.346	3.269	5.618	7.070
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.0287	0.0811	0.1449	0.0904	0.0831	-0.0707
Corn silage	-0.0653	-0.0589	0.1988	-0.0094	-0.0476	-0.0920
Barley	0.1411	0.2580	0.3343	0.2411	0.3422	0.4303
Oats	0.1245	0.2332	0.1972	0.0667	0.0949	0.1123
Rice	-0.1349	-0.0596	-0.0200	-0.1460	-0.0215	0.0627
Sugar beets	0.0810	0.0593	-0.1440	0.8972	1.3079	0.9831
Winter wheat	0.0954	0.0593	0.0780	0.0095	-0.0369	-0.0164
Hay alfalfa	0.0815	0.2218	0.3073	0.1964	0.2462	0.2539
Grapes (wine)	0.5938	0.8634	0.8993	0.6124	0.8010	0.9233
English walnuts	0.3726	0.7032	0.7485	0.3305	0.4881	0.6128
Potatoes	0.0446	0.0055	-0.0207	0.0088	-0.0369	-0.0601

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 38. Percent change in yields for the coast region of California,^a by scenario, when temperature and precipitation changes by month, with CO₂ fertilizer effects

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.486	3.841	4.802
Apr	0.810	3.164	4.387	2.212	3.847	5.560
May	-0.506	0.994	3.616	1.602	2.459	4.185
Jun	0.063	1.867	3.793	2.329	3.935	5.362
Jul	0.463	2.898	4.149	2.668	4.329	6.331
Aug	1.352	2.849	4.016	2.056	4.221	6.383
Sep	1.645	3.775	5.056	3.236	5.017	7.382
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation. change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0	0	0	0	0	0
Crop						
Change in yield (% change/100)						
Corn grain	0.1171	0.1983	0.2216	0.3640	0.5398	0.6972
Corn silage	-0.2225	-0.2676	-0.3008	-0.2032	-0.2894	-0.3002
Barley	0.1677	0.1446	0.1504	0.1165	0.1360	0.1554
Dry beans	0.2111	0.2583	0.2570	0.2907	0.3498	0.3884
Oats	0.3717	0.3392	0.3287	0.2736	0.2984	0.3845
Sugar beets	0.2442	0.3084	0.4425	0.4394	0.5101	0.5017
Winter wheat	-0.0401	0.0372	0.0510	0.0382	0.0881	0.1603
Valencia orange	0.2377	0.2206	0.1155	0.4743	0.2859	0.2852
Hay alfalfa	0.2186	0.2532	0.2923	0.2019	0.2369	0.2403
Grapes (wine)	0.8975	0.9522	0.8507	0.7540	0.7751	0.7629
Tomatoes (fresh)	0.2530	0.3439	0.3804	0.3054	0.2963	0.3116
Tomatoes (processed)	0.1621	0.1556	0.1765	0.1326	0.1747	0.2223
Almonds	0.4058	0.6061	0.8044	0.4823	0.5580	0.7600
English walnuts	0.8168	0.8674	0.8317	0.4777	0.5284	0.5087
Prunes (dried)	0.5813	0.6502	0.8342	0.6099	0.6635	0.7831

Table 38. Percent change in yields for the coast region of California,^a by scenario, when temperature and precipitation changes by month, with CO₂ fertilizer effects (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Avocados	0.2587	0.2253	0.2603	0.2161	0.1883	0.2176
Potatoes	-0.1105	-0.1271	-0.1583	-0.1081	-0.1522	-0.1825

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 39. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.028	2.918	5.872	3.031	3.946	5.294
Apr	0.614	2.831	3.389	2.504	4.086	6.268
May	-0.139	1.863	4.720	1.582	2.826	4.358
Jun	0.560	1.985	3.967	2.203	4.322	5.751
Jul	0.871	3.744	4.644	3.110	5.083	7.198
Aug	1.001	3.289	3.838	2.183	4.883	6.863
Sep	1.627	3.758	4.860	2.929	5.213	6.784
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.141	-0.936	-1.501	3.040	3.371	2.950
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.0081	0.0346	0.0429	0.0893	0.1065	0.1252
Corn silage	0.0238	0.0178	0.0298	0.0161	0.0193	-0.0122
Barley	-0.0348	-0.0686	-0.0619	-0.1509	-0.1581	-0.1653
Sorghum	0.0180	0.0281	0.0075	-0.0504	-0.0374	-0.0192
Dry beans	0.0070	0.0347	0.0498	0.0376	0.0638	0.0479
Oats	-0.0236	0.0300	0.0386	-0.1034	-0.0902	-0.0654
Rice	0.0288	0.0556	0.0384	0.0168	0.0589	0.0538
Sugar beets	0.0081	0.0024	0.0393	0.0241	0.0368	0.1002
Winter wheat	-0.0079	0.0213	0.0657	-0.0474	-0.0090	0.0118
Valencia orange	0.1285	0.1116	0.0179	0.3288	0.0905	0.1359
Hay alfalfa	0.0049	0.0661	0.1062	0.0468	0.0823	0.1019
Grapes (table, raisin)	0.1679	0.1015	0.0434	-0.2136	-0.1318	-0.1936
Grapes (wine)	0.0035	0.0992	0.0625	-0.0158	0.0485	0.0833
Tomatoes (fresh)	-0.0096	-0.0302	-0.0442	-0.0019	-0.1034	-0.1904

Table 39. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation change by month (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Tomatoes (processed)	0.0240	0.0142	0.0011	-0.0271	0.0122	0.0358
Almonds	0.1340	0.2979	0.4019	0.2069	0.3032	0.3724
English walnuts	-0.0265	0.0860	0.0486	-0.1149	-0.0621	0.0137
Prunes (dried)	0.0424	0.1942	0.3267	0.1346	0.3012	0.4879
Olives	-0.0063	-0.0005	-0.0647	-0.2001	-0.2124	-0.2346
Potatoes	-0.0159	-0.0350	-0.0945	-0.0514	-0.0859	-0.1228

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 40. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.632	3.719	4.556
Apr	1.046	3.481	4.801	2.102	3.922	5.677
May	-0.362	1.238	4.102	1.240	2.000	3.677
Jun	-0.034	2.032	4.120	2.486	4.316	5.747
Jul	0.533	3.398	4.619	2.898	4.828	6.809
Aug	1.730	3.355	4.757	1.984	4.523	6.718
Sep	1.976	4.255	5.722	3.512	5.288	7.724
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.0025	-0.0113	-0.0367	-0.0326	-0.0231	-0.0487
Corn silage	0.0303	0.0342	0.0630	0.1010	0.0850	0.0836
Barley	-0.0228	-0.0790	-0.1186	-0.1567	-0.1369	-0.1443
Sorghum	-0.0261	-0.0538	-0.0479	-0.0925	-0.0676	-0.0704
Cotton (pima)	-0.0182	-0.0081	-0.0371	0.1319	0.0225	0.0704
Cotton	-0.0286	-0.0442	-0.0616	-0.1122	-0.1351	-0.1422
Dry beans	-0.0821	-0.1359	-0.2060	-0.1141	-0.0757	-0.0836
Oats	-0.0480	-0.1076	-0.1809	-0.1194	-0.1407	-0.2316
Rice	0.0081	-0.0206	-0.0388	-0.0129	-0.0098	-0.0437
Sugar beets	-0.0224	-0.0419	-0.0237	-0.0323	-0.0871	-0.1152
Winter wheat	-0.0372	-0.0325	-0.0309	-0.0611	-0.0443	-0.0543
Durum wheat	-0.0365	-0.0344	0.0014	0.0808	0.0518	0.0792
Valencia orange	-0.0402	-0.0614	-0.1363	0.1496	0.0558	0.1027
Hay alfalfa	0.0181	0.0755	0.1207	0.0328	0.0547	0.0575

Table 40. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation changes by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Grapes (table, raisin)	0.1004	-0.1184	-0.0570	-0.1761	-0.4160	-0.3808
Grapes (wine)	0.0255	0.0776	0.0633	0.0061	0.0272	0.0609
Tomatoes (fresh)	-0.0439	-0.0974	-0.1870	-0.2276	-0.3253	-0.5197
Tomatoes (processed)	0.0021	-0.0163	-0.0129	-0.0485	-0.0103	0.0378
Almonds	0.1733	0.3272	0.4546	0.2979	0.2717	0.3854
English walnuts	0.0316	0.0806	0.0422	-0.0906	-0.0102	0.0079
Prunes (dried)	0.1362	0.3041	0.4610	0.1802	0.3496	0.5275
Olives	-0.0556	-0.1792	-0.1836	-0.3146	-0.4235	-0.4830
Avocados	-0.0007	-0.1474	-0.0565	-0.1221	-0.1770	-0.1267
Potatoes	-0.0612	-0.0938	-0.1491	-0.0793	-0.1359	-0.1693

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 41. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.819	2.664	5.540	3.433	4.028	5.575
Apr	0.653	2.624	3.231	2.680	4.417	6.754
May	-0.011	2.160	5.274	1.354	2.534	3.967
Jun	0.740	2.142	4.451	2.482	4.747	6.286
Jul	0.922	4.126	5.029	3.422	5.686	7.749
Aug	1.265	3.686	4.262	2.291	5.593	7.585
Sep	1.975	4.244	5.346	3.269	5.618	7.070
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	-0.0012	0.0386	0.0776	0.0536	0.0401	-0.0679
Corn silage	-0.0953	-0.0889	0.1688	-0.0394	-0.0776	-0.1220
Barley	-0.0164	0.0708	0.1110	0.0706	0.1317	0.1721
Oats	-0.0326	0.0596	0.0278	-0.0857	-0.0530	-0.0356
Rice	-0.2542	-0.1601	-0.1164	-0.2642	-0.1310	-0.0598
Sugar beets	-0.1071	-0.1095	-0.2415	0.6274	0.8619	0.5497
Winter wheat	-0.0552	-0.0702	-0.0498	-0.1295	-0.1370	-0.1070
Hay alfalfa	-0.0182	0.1174	0.1963	0.0950	0.1409	0.1457
Grapes (wine)	0.2862	0.4046	0.3673	0.3017	0.3634	0.3808
English walnuts	0.1052	0.3183	0.3057	0.0691	0.1672	0.2225
Potatoes	-0.0152	-0.0530	-0.0776	-0.0506	-0.0944	-0.1155

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 42. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.486	3.841	4.802
Apr	0.810	3.164	4.387	2.212	3.847	5.560
May	-0.506	0.994	3.616	1.602	2.459	4.185
Jun	0.063	1.867	3.793	2.329	3.935	5.362
Jul	0.463	2.898	4.149	2.668	4.329	6.331
Aug	1.352	2.849	4.016	2.056	4.221	6.383
Sep	1.645	3.775	5.056	3.236	5.017	7.382
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.0871	0.1683	0.1916	0.3340	0.5098	0.6672
Corn silage	-0.2525	-0.2976	-0.3308	-0.2332	-0.3194	-0.3302
Barley	0.0071	-0.0131	-0.0076	-0.0405	-0.0204	-0.0036
Dry beans	0.0111	0.0583	0.0570	0.0907	0.1498	0.1884
Oats	0.2117	0.1792	0.1687	0.1136	0.1384	0.2245
Sugar beets	0.0442	0.1084	0.2425	0.2394	0.3101	0.3017
Winter wheat	-0.1712	-0.0854	-0.0660	-0.1042	-0.0500	0.0002
Valencia orange	-0.0709	-0.0714	-0.1295	0.1329	-0.0245	-0.0220
Hay alfalfa	0.1170	0.1483	0.1833	0.1005	0.1325	0.1337
Grapes (wine)	0.4892	0.3916	0.2770	0.3808	0.2929	0.2365
Tomatoes (fresh)	0.0030	0.0939	0.1304	0.0554	0.0463	0.0616
Tomatoes (processed)	-0.0715	-0.0604	-0.0402	-0.0954	-0.0482	-0.0151
Almonds	0.1435	0.2759	0.3811	0.2140	0.2386	0.3506
English walnuts	0.4674	0.4059	0.3291	0.1878	0.1830	0.1464
Prunes (dried)	0.3313	0.4002	0.5842	0.3599	0.4135	0.5331

App. IX: Climate Change Effects on Crop Yield and Water Use

Table 42. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 0.25% technological change, when temperature and precipitation changes by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Avocados	0.0087	-0.0247	0.0103	-0.0339	-0.0617	-0.0324
Potatoes	-0.1686	-0.1820	-0.2096	-0.1661	-0.2064	-0.2328

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 43. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.028	2.918	5.872	3.031	3.946	5.294
Apr	0.614	2.831	3.389	2.504	4.086	6.268
May	-0.139	1.863	4.720	1.582	2.826	4.358
Jun	0.560	1.985	3.967	2.203	4.322	5.751
Jul	0.871	3.744	4.644	3.110	5.083	7.198
Aug	1.001	3.289	3.838	2.183	4.883	6.863
Sep	1.627	3.758	4.860	2.929	5.213	6.784
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.141	-0.936	-1.501	3.040	3.371	2.950
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0058	0.0185	0.0200	0.0635	0.0568	0.0584
Corn silage	0.0184	0.0106	0.0156	0.0124	0.0115	-0.0064
Barley	-0.0286	-0.0452	-0.0361	-0.1238	-0.1042	-0.0965
Sorghum	0.0146	0.0181	0.0043	-0.0408	-0.0241	-0.0110
Dry beans	0.0070	0.0347	0.0498	0.0376	0.0638	0.0479
Oats	-0.0164	0.0154	0.0174	-0.0716	-0.0465	-0.0295
Rice	0.0221	0.0330	0.0200	0.0129	0.0349	0.0280
Sugar beets	0.0074	0.0020	0.0300	0.0222	0.0303	0.0765
Winter wheat	-0.0059	0.0121	0.0325	-0.0354	-0.0051	0.0058
Valencia orange	0.0761	0.0481	0.0068	0.1948	0.0390	0.0518
Hay alfalfa	0.0047	0.0606	0.0937	0.0452	0.0754	0.0899
Grapes (table, raisin)	0.1187	0.0537	0.0201	-0.1511	-0.0697	-0.0895
Grapes (wine)	0.0026	0.0566	0.0312	-0.0118	0.0276	0.0416
Tomatoes (fresh)	-0.0096	-0.0302	-0.0442	-0.0019	-0.1034	-0.1904

Table 43. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation change by month (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Tomatoes (processed)	0.0162	0.0070	0.0005	-0.0182	0.0061	0.0156
Almonds	0.1084	0.1778	0.2074	0.1674	0.1810	0.1922
English walnuts	-0.0209	0.0534	0.0266	-0.0908	-0.0385	0.0075
Prunes (dried)	0.0424	0.1942	0.3267	0.1346	0.3012	0.4879
Olives	-0.0045	-0.0003	-0.0304	-0.1432	-0.1141	-0.1102
Potatoes	-0.0154	-0.0322	-0.0836	-0.0497	-0.0790	-0.1087

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 44. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.632	3.719	4.556
Apr	1.046	3.481	4.801	2.102	3.922	5.677
May	-0.362	1.238	4.102	1.240	2.000	3.677
Jun	-0.034	2.032	4.120	2.486	4.316	5.747
Jul	0.533	3.398	4.619	2.898	4.828	6.809
Aug	1.730	3.355	4.757	1.984	4.523	6.718
Sep	1.976	4.255	5.722	3.512	5.288	7.724
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0017	-0.0058	-0.0164	-0.0224	-0.0118	-0.0217
Corn silage	0.0250	0.0227	0.0370	0.0831	0.0563	0.0490
Barley	-0.0189	-0.0529	-0.0706	-0.1299	-0.0918	-0.0858
Sorghum	-0.0213	-0.0351	-0.0276	-0.0754	-0.0441	-0.0406
Cotton (pima)	-0.0108	-0.0035	-0.0142	0.0785	0.0097	0.0269
Cotton	-0.0230	-0.0281	-0.0345	-0.0901	-0.0859	-0.0798
Dry beans	-0.0821	-0.1359	-0.2060	-0.1141	-0.0757	-0.0836
Oats	-0.0322	-0.0532	-0.0783	-0.0801	-0.0695	-0.1002
Rice	0.0060	-0.0115	-0.0189	-0.0095	-0.0055	-0.0213
Sugar beets	-0.0193	-0.0301	-0.0153	-0.0278	-0.0625	-0.0742
Winter wheat	-0.0282	-0.0188	-0.0157	-0.0464	-0.0256	-0.0275
Durum wheat	-0.0286	-0.0209	0.0007	0.0633	0.0314	0.0421
Valencia orange	-0.0238	-0.0264	-0.0519	0.0885	0.0240	0.0391
Hay alfalfa	0.0176	0.0697	0.1075	0.0317	0.0505	0.0513

Table 44. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation changes by month (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Grapes (table, raisin)	0.0713	-0.0629	-0.0264	-0.1250	-0.2207	-0.1767
Grapes (wine)	0.0194	0.0455	0.0325	0.0046	0.0160	0.0313
Tomatoes (fresh)	-0.0439	-0.0974	-0.1870	-0.2276	-0.3253	-0.5197
Tomatoes (processed)	0.0015	-0.0083	-0.0057	-0.0334	-0.0053	0.0169
Almonds	0.1401	0.1953	0.2346	0.2409	0.1622	0.1989
English walnuts	0.0254	0.0513	0.0237	-0.0728	-0.0065	0.0044
Prunes (dried)	0.1362	0.3041	0.4610	0.1802	0.3496	0.5275
Olives	-0.0390	-0.0936	-0.0839	-0.2207	-0.2213	-0.2206
Avocados	-0.0007	-0.1474	-0.0565	-0.1221	-0.1770	-0.1267
Potatoes	-0.0591	-0.0857	-0.1309	-0.0766	-0.1242	-0.1486

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 45. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.819	2.664	5.540	3.433	4.028	5.575
Apr	0.653	2.624	3.231	2.680	4.417	6.754
May	-0.011	2.160	5.274	1.354	2.534	3.967
Jun	0.740	2.142	4.451	2.482	4.747	6.286
Jul	0.922	4.126	5.029	3.422	5.686	7.749
Aug	1.265	3.686	4.262	2.291	5.593	7.585
Sep	1.975	4.244	5.346	3.269	5.618	7.070
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	-0.0009	0.0223	0.0393	0.0401	0.0231	-0.0344
Corn silage	-0.0953	-0.0889	0.1688	-0.0394	-0.0776	-0.1220
Barley	-0.0118	0.0387	0.0531	0.0508	0.0719	0.0824
Oats	-0.0262	0.0383	0.0158	-0.0688	-0.0341	-0.0202
Rice	-0.1922	-0.0937	-0.0599	-0.1997	-0.0767	-0.0308
Sugar beets	-0.0824	-0.0657	-0.1275	0.4824	0.5174	0.2902
Winter wheat	-0.0385	-0.0367	-0.0228	-0.0903	-0.0717	-0.0491
Hay alfalfa	-0.0174	0.1059	0.1694	0.0911	0.1271	0.1258
Grapes (wine)	0.1904	0.2001	0.1594	0.2008	0.1798	0.1653
English walnuts	0.0738	0.1681	0.1415	0.0484	0.0883	0.1030
Potatoes	-0.0147	-0.0492	-0.0697	-0.0491	-0.0876	-0.1037

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 46. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation changes by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.486	3.841	4.802
Apr	0.810	3.164	4.387	2.212	3.847	5.560
May	-0.506	0.994	3.616	1.602	2.459	4.185
Jun	0.063	1.867	3.793	2.329	3.935	5.362
Jul	0.463	2.898	4.149	2.668	4.329	6.331
Aug	1.352	2.849	4.016	2.056	4.221	6.383
Sep	1.645	3.775	5.056	3.236	5.017	7.382
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0871	0.1683	0.1916	0.3340	0.5098	0.6672
Corn silage	-0.2525	-0.2976	-0.3308	-0.2332	-0.3194	-0.3302
Barley	0.0059	-0.0090	-0.0047	-0.0337	-0.0140	-0.0022
Dry beans	0.0111	0.0583	0.0570	0.0907	0.1498	0.1884
Oats	0.2117	0.1792	0.1687	0.1136	0.1384	0.2245
Sugar beets	0.0442	0.1084	0.2425	0.2394	0.3101	0.3017
Winter wheat	-0.1194	-0.0447	-0.0302	-0.0727	-0.0262	0.0001
Valencia orange	-0.0501	-0.0387	-0.0617	0.0940	-0.0133	-0.0105
Hay alfalfa	0.1125	0.1352	0.1607	0.0966	0.1208	0.1172
Grapes (wine)	0.2822	0.1683	0.1059	0.2197	0.1259	0.0904
Tomatoes (fresh)	0.0030	0.0939	0.1304	0.0554	0.0463	0.0616
Tomatoes (processed)	-0.0458	-0.0290	-0.0170	-0.0612	-0.0232	-0.0064
Almonds	0.1160	0.1646	0.1967	0.1731	0.1424	0.1809
English walnuts	0.3063	0.2002	0.1429	0.1231	0.0903	0.0636
Prunes (dried)	0.3313	0.4002	0.5842	0.3599	0.4135	0.5331

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Table 46. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 1.0% technological change, when temperature and precipitation changes by month (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Avocados	0.0087	-0.0247	0.0103	-0.0339	-0.0617	-0.0324
Potatoes	-0.1630	-0.1681	-0.1872	-0.1606	-0.1906	-0.2078

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 47. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.028	2.918	5.872	3.031	3.946	5.294
Apr	0.614	2.831	3.389	2.504	4.086	6.268
May	-0.139	1.863	4.720	1.582	2.826	4.358
Jun	0.560	1.985	3.967	2.203	4.322	5.751
Jul	0.871	3.744	4.644	3.110	5.083	7.198
Aug	1.001	3.289	3.838	2.183	4.883	6.863
Sep	1.627	3.758	4.860	2.929	5.213	6.784
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.14	-0.94	-1.50	3.04	3.37	2.95
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.0381	0.0346	0.0429	0.0893	0.1065	0.1252
Corn silage	0.0538	0.0178	0.0298	0.0161	0.0193	-0.0122
Barley	0.1252	-0.0686	-0.0619	-0.1509	-0.1581	-0.1653
Sorghum	0.0880	0.0281	0.0075	-0.0504	-0.0374	-0.0192
Dry beans	0.2070	0.0347	0.0498	0.0376	0.0638	0.0479
Oats	0.1364	0.0300	0.0386	-0.1034	-0.0902	-0.0654
Rice	0.1788	0.0556	0.0384	0.0168	0.0589	0.0538
Sugar beets	0.2081	0.0024	0.0393	0.0241	0.0368	0.1002
Winter wheat	0.1521	0.0213	0.0657	-0.0474	-0.0090	0.0118
Valencia orange	0.4485	0.1116	0.0179	0.3288	0.0905	0.1359
Hay alfalfa	0.1049	0.0661	0.1062	0.0468	0.0823	0.1019
Grapes (table, raisin)	0.4179	0.1015	0.0434	-0.2136	-0.1318	-0.1936
Grapes (wine)	0.2535	0.0992	0.0625	-0.0158	0.0485	0.0833
Tomatoes (fresh)	0.2404	-0.0302	-0.0442	-0.0019	-0.1034	-0.1904

Table 47. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Tomatoes (processed)	0.2740	0.0142	0.0011	-0.0271	0.0122	0.0358
Almonds	0.3840	0.2979	0.4019	0.2069	0.3032	0.3724
English walnuts	0.2235	0.0860	0.0486	-0.1149	-0.0621	0.0137
Prunes (dried)	0.2924	0.1942	0.3267	0.1346	0.3012	0.4879
Olives	0.2437	-0.0005	-0.0647	-0.2001	-0.2124	-0.2346
Potatoes	0.0441	-0.0350	-0.0945	-0.0514	-0.0859	-0.1228

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 48. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.63	3.719	4.56
Apr	1.046	3.481	4.801	2.10	3.922	5.68
May	-0.362	1.238	4.102	1.24	2.000	3.68
Jun	-0.034	2.032	4.120	2.49	4.316	5.75
Jul	0.533	3.398	4.619	2.90	4.828	6.81
Aug	1.730	3.355	4.757	1.98	4.523	6.72
Sep	1.976	4.255	5.722	3.51	5.288	7.72
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.0325	-0.0113	-0.0367	-0.0326	-0.0231	-0.0487
Corn silage	0.0603	0.0342	0.0630	0.1010	0.0850	0.0836
Barley	0.1372	-0.0790	-0.1186	-0.1567	-0.1369	-0.1443
Sorghum	0.0439	-0.0538	-0.0479	-0.0925	-0.0676	-0.0704
Cotton (pima)	0.1418	-0.0081	-0.0371	0.1319	0.0225	0.0704
Cotton	0.1314	-0.0442	-0.0616	-0.1122	-0.1351	-0.1422
Dry beans	0.1179	-0.1359	-0.2060	-0.1141	-0.0757	-0.0836
Oats	0.1120	-0.1076	-0.1809	-0.1194	-0.1407	-0.2316
Rice	0.1581	-0.0206	-0.0388	-0.0129	-0.0098	-0.0437
Sugar beets	0.1776	-0.0419	-0.0237	-0.0323	-0.0871	-0.1152
Winter wheat	0.1228	-0.0325	-0.0309	-0.0611	-0.0443	-0.0543
Durum wheat	0.1235	-0.0344	0.0014	0.0808	0.0518	0.0792
Valencia orange	0.2798	-0.0614	-0.1363	0.1496	0.0558	0.1027
Hay alfalfa	0.1181	0.0755	0.1207	0.0328	0.0547	0.0575

Table 48. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Grapes (table, raisin)	0.3504	-0.1184	-0.0570	-0.1761	-0.4160	-0.3808
Grapes (wine)	0.2755	0.0776	0.0633	0.0061	0.0272	0.0609
Tomatoes (fresh)	0.2061	-0.0974	-0.1870	-0.2276	-0.3253	-0.5197
Tomatoes (processed)	0.2521	-0.0163	-0.0129	-0.0485	-0.0103	0.0378
Almonds	0.4233	0.3272	0.4546	0.2979	0.2717	0.3854
English walnuts	0.2816	0.0806	0.0422	-0.0906	-0.0102	0.0079
Prunes (dried)	0.3862	0.3041	0.4610	0.1802	0.3496	0.5275
Olives	0.1944	-0.1792	-0.1836	-0.3146	-0.4235	-0.4830
Avocados	0.2493	-0.1474	-0.0565	-0.1221	-0.1770	-0.1267
Potatoes	-0.0012	-0.0938	-0.1491	-0.0793	-0.1359	-0.1693

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 49. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.82	2.664	5.540	3.43	4.028	5.57
Apr	0.65	2.624	3.231	2.68	4.417	6.75
May	-0.01	2.160	5.274	1.35	2.534	3.97
Jun	0.74	2.142	4.451	2.48	4.747	6.29
Jul	0.92	4.126	5.029	3.42	5.686	7.75
Aug	1.27	3.686	4.262	2.29	5.593	7.59
Sep	1.97	4.244	5.346	3.27	5.618	7.07
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
	Change in yield (% change/100)					
Corn grain	0.0288	0.0386	0.0776	0.0536	0.0401	-0.0679
Corn silage	-0.0653	-0.0889	0.1688	-0.0394	-0.0776	-0.1220
Barley	0.1436	0.0708	0.1110	0.0706	0.1317	0.1721
Oats	0.1274	0.0596	0.0278	-0.0857	-0.0530	-0.0356
Rice	-0.1042	-0.1601	-0.1164	-0.2642	-0.1310	-0.0598
Sugar beets	0.0929	-0.1095	-0.2415	0.6274	0.8619	0.5497
Winter wheat	0.1048	-0.0702	-0.0498	-0.1295	-0.1370	-0.1070
Hay alfalfa	0.0818	0.1174	0.1963	0.0950	0.1409	0.1457
Grapes (wine)	0.5362	0.4046	0.3673	0.3017	0.3634	0.3808
English walnuts	0.3552	0.3183	0.3057	0.0691	0.1672	0.2225
Potatoes	0.0448	-0.0530	-0.0776	-0.0506	-0.0944	-0.1155

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 50. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.49	3.84	4.80
Apr	0.810	3.164	4.387	2.21	3.85	5.56
May	-0.506	0.994	3.616	1.60	2.46	4.19
Jun	0.063	1.867	3.793	2.33	3.93	5.36
Jul	0.463	2.898	4.149	2.67	4.33	6.33
Aug	1.352	2.849	4.016	2.06	4.22	6.38
Sep	1.645	3.775	5.056	3.24	5.02	7.38
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	0.25	0.25	0.25	0.25	0.25	0.25
Crop						
Change in yield (% change/100)						
Corn grain	0.1171	0.1683	0.1916	0.3340	0.5098	0.6672
Corn silage	-0.2225	-0.2976	-0.3308	-0.2332	-0.3194	-0.3302
Barley	0.1671	-0.0131	-0.0076	-0.0405	-0.0204	-0.0036
Dry beans	0.2111	0.0583	0.0570	0.0907	0.1498	0.1884
Oats	0.3717	0.1792	0.1687	0.1136	0.1384	0.2245
Sugar beets	0.2442	0.1084	0.2425	0.2394	0.3101	0.3017
Winter wheat	-0.0112	-0.0854	-0.0660	-0.1042	-0.0500	0.0002
Valencia orange	0.2491	-0.0714	-0.1295	0.1329	-0.0245	-0.0220
Hay alfalfa	0.2170	0.1483	0.1833	0.1005	0.1325	0.1337
Grapes (wine)	0.7392	0.3916	0.2770	0.3808	0.2929	0.2365
Tomatoes (fresh)	0.2530	0.0939	0.1304	0.0554	0.0463	0.0616
Tomatoes (processed)	0.1785	-0.0604	-0.0402	-0.0954	-0.0482	-0.0151
Almonds	0.3935	0.2759	0.3811	0.2140	0.2386	0.3506
English walnuts	0.7174	0.4059	0.3291	0.1878	0.1830	0.1464

Table 50. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 0.25% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Prunes (dried)	0.5813	0.4002	0.5842	0.3599	0.4135	0.5331
Avocados	0.2587	-0.0247	0.0103	-0.0339	-0.0617	-0.0324
Potatoes	-0.1086	-0.1820	-0.2096	-0.1661	-0.2064	-0.2328

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Table 51. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.03	2.92	5.87	3.03	3.946	5.29
Apr	0.61	2.83	3.39	2.50	4.086	6.27
May	-0.14	1.86	4.72	1.58	2.826	4.36
Jun	0.56	1.99	3.97	2.20	4.322	5.75
Jul	0.87	3.74	4.64	3.11	5.083	7.20
Aug	1.00	3.29	3.84	2.18	4.883	6.86
Sep	1.63	3.76	4.86	2.93	5.213	6.78
Change in precipitation (inches)						
Mar	-0.179	-0.369	-1.105	1.839	2.901	2.288
Apr	0.030	-0.428	0.250	0.610	-0.034	0.095
May	0.162	0.030	-0.210	0.652	0.633	0.496
Jun	0.020	0.167	-0.038	0.026	0.012	0.116
Jul	0.024	-0.031	-0.030	-0.032	-0.036	0.000
Aug	-0.105	-0.120	-0.122	-0.027	-0.084	-0.013
Sep	-0.093	-0.186	-0.246	-0.028	-0.022	-0.032
Total precipitation change	-0.14	-0.94	-1.50	3.04	3.37	2.95
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0358	0.0185	0.0200	0.0635	0.0568	0.0584
Corn silage	0.0484	0.0106	0.0156	0.0124	0.0115	-0.0064
Barley	0.1314	-0.0452	-0.0361	-0.1238	-0.1042	-0.0965
Sorghum	0.0846	0.0181	0.0043	-0.0408	-0.0241	-0.0110
Dry beans	0.2070	0.0347	0.0498	0.0376	0.0638	0.0479
Oats	0.1436	0.0154	0.0174	-0.0716	-0.0465	-0.0295
Rice	0.1721	0.0330	0.0200	0.0129	0.0349	0.0280
Sugar beets	0.2074	0.0020	0.0300	0.0222	0.0303	0.0765
Winter wheat	0.1541	0.0121	0.0325	-0.0354	-0.0051	0.0058
Valencia orange	0.3961	0.0481	0.0068	0.1948	0.0390	0.0518
Hay alfalfa	0.1047	0.0606	0.0937	0.0452	0.0754	0.0899
Grapes (table, raisin)	0.3687	0.0537	0.0201	-0.1511	-0.0697	-0.0895
Grapes (wine)	0.2526	0.0566	0.0312	-0.0118	0.0276	0.0416
Tomatoes (fresh)	0.2404	-0.0302	-0.0442	-0.0019	-0.1034	-0.1904

Table 51. Percent change in yields for the Sacramento and delta regions of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Tomatoes (processed)	0.2662	0.0070	0.0005	-0.0182	0.0061	0.0156
Almonds	0.3584	0.1778	0.2074	0.1674	0.1810	0.1922
English walnuts	0.2291	0.0534	0.0266	-0.0908	-0.0385	0.0075
Prunes (dried)	0.2924	0.1942	0.3267	0.1346	0.3012	0.4879
Olives	0.2455	-0.0003	-0.0304	-0.1432	-0.1141	-0.1102
Potatoes	0.0446	-0.0322	-0.0836	-0.0497	-0.0790	-0.1087

a. This region includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Tehema, Yolo, and Yuba counties.

Table 52. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.793	3.397	6.446	2.63	3.719	4.56
Apr	1.046	3.481	4.801	2.10	3.922	5.68
May	-0.362	1.238	4.102	1.24	2.000	3.68
Jun	-0.034	2.032	4.120	2.49	4.316	5.75
Jul	0.533	3.398	4.619	2.90	4.828	6.81
Aug	1.730	3.355	4.757	1.98	4.523	6.72
Sep	1.976	4.255	5.722	3.51	5.288	7.72
Change in precipitation (inches)						
Mar	-0.460	-0.361	-0.692	0.989	1.897	2.320
Apr	-0.138	-0.459	-0.368	0.512	0.035	0.224
May	0.067	0.072	-0.174	0.599	0.554	0.579
Jun	0.068	0.055	-0.022	0.040	0.046	0.172
Jul	-0.038	-0.101	-0.094	-0.068	-0.045	0.006
Aug	-0.112	-0.092	-0.191	-0.121	0.087	0.039
Sep	-0.105	-0.134	-0.235	-0.172	-0.051	0.088
Total precipitation change	-0.717	-1.020	-1.776	1.777	2.523	3.428
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0317	-0.0058	-0.0164	-0.0224	-0.0118	-0.0217
Corn silage	0.0550	0.0227	0.0370	0.0831	0.0563	0.0490
Barley	0.1411	-0.0529	-0.0706	-0.1299	-0.0918	-0.0858
Sorghum	0.0487	-0.0351	-0.0276	-0.0754	-0.0441	-0.0406
Cotton (pima)	0.1492	-0.0035	-0.0142	0.0785	0.0097	0.0269
Cotton	0.1370	-0.0281	-0.0345	-0.0901	-0.0859	-0.0798
Dry beans	0.1179	-0.1359	-0.2060	-0.1141	-0.0757	-0.0836
Oats	0.1278	-0.0532	-0.0783	-0.0801	-0.0695	-0.1002
Rice	0.1560	-0.0115	-0.0189	-0.0095	-0.0055	-0.0213
Sugar beets	0.1807	-0.0301	-0.0153	-0.0278	-0.0625	-0.0742
Winter wheat	0.1318	-0.0188	-0.0157	-0.0464	-0.0256	-0.0275
Durum wheat	0.1314	-0.0209	0.0007	0.0633	0.0314	0.0421
Valencia orange	0.2962	-0.0264	-0.0519	0.0885	0.0240	0.0391
Hay alfalfa	0.1176	0.0697	0.1075	0.0317	0.0505	0.0513

Table 52. Percent change in yields for the San Joaquin Valley and desert regions of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Crop (cont.)	Change in yield (% change/100)					
Grapes (table, raisin)	0.3213	-0.0629	-0.0264	-0.1250	-0.2207	-0.1767
Grapes (wine)	0.2694	0.0455	0.0325	0.0046	0.0160	0.0313
Tomatoes (fresh)	0.2061	-0.0974	-0.1870	-0.2276	-0.3253	-0.5197
Tomatoes (processed)	0.2515	-0.0083	-0.0057	-0.0334	-0.0053	0.0169
Almonds	0.3901	0.1953	0.2346	0.2409	0.1622	0.1989
English walnuts	0.2754	0.0513	0.0237	-0.0728	-0.0065	0.0044
Prunes (dried)	0.3862	0.3041	0.4610	0.1802	0.3496	0.5275
Olives	0.2110	-0.0936	-0.0839	-0.2207	-0.2213	-0.2206
Avocados	0.2493	-0.1474	-0.0565	-0.1221	-0.1770	-0.1267
Potatoes	0.0009	-0.0857	-0.1309	-0.0766	-0.1242	-0.1486

a. This region includes Fresno, Imperial, Kern, Kings, Madera, Merced, Riverside, Stanislaus, and Tulare counties.

Table 53. Percent change in yields for the northeast and mountain regions of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	0.82	2.664	5.540	3.43	4.028	5.57
Apr	0.65	2.624	3.231	2.68	4.417	6.75
May	-0.01	2.160	5.274	1.35	2.534	3.97
Jun	0.74	2.142	4.451	2.48	4.747	6.29
Jul	0.92	4.126	5.029	3.42	5.686	7.75
Aug	1.27	3.686	4.262	2.29	5.593	7.59
Sep	1.97	4.244	5.346	3.27	5.618	7.07
Change in precipitation (inches)						
Mar	-0.185	-0.375	-1.229	1.903	3.007	2.286
Apr	0.011	-0.524	0.314	0.689	-0.099	0.065
May	0.262	0.041	-0.508	0.923	0.896	0.874
Jun	0.327	0.486	-0.039	0.082	0.098	0.194
Jul	0.112	-0.129	-0.169	-0.164	-0.165	-0.014
Aug	-0.251	-0.343	-0.336	-0.096	-0.203	-0.110
Sep	-0.136	-0.350	-0.455	0.068	-0.029	0.049
Total precipitation change	0.139	-1.193	-2.422	3.406	3.506	3.344
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.0291	0.0223	0.0393	0.0401	0.0231	-0.0344
Corn silage	-0.0653	-0.0889	0.1688	-0.0394	-0.0776	-0.1220
Barley	0.1482	0.0387	0.0531	0.0508	0.0719	0.0824
Oats	0.1338	0.0383	0.0158	-0.0688	-0.0341	-0.0202
Rice	-0.0422	-0.0937	-0.0599	-0.1997	-0.0767	-0.0308
Sugar beets	0.1176	-0.0657	-0.1275	0.4824	0.5174	0.2902
Winter wheat	0.1215	-0.0367	-0.0228	-0.0903	-0.0717	-0.0491
Hay alfalfa	0.0826	0.1059	0.1694	0.0911	0.1271	0.1258
Grapes (wine)	0.4404	0.2001	0.1594	0.2008	0.1798	0.1653
English walnuts	0.3238	0.1681	0.1415	0.0484	0.0883	0.1030
Potatoes	0.0453	-0.0492	-0.0697	-0.0491	-0.0876	-0.1037

a. This region includes Calaveras, El Dorado, Lassen, Mariposa, Modoc, Nevada, Placer, Shasta, Siskiyou, and Tuolumne counties.

Table 54. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month

	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in temperature (°F)						
Mar	1.580	3.292	6.221	2.49	3.84	4.80
Apr	0.810	3.164	4.387	2.21	3.85	5.56
May	-0.506	0.994	3.616	1.60	2.46	4.19
Jun	0.063	1.867	3.793	2.33	3.93	5.36
Jul	0.463	2.898	4.149	2.67	4.33	6.33
Aug	1.352	2.849	4.016	2.06	4.22	6.38
Sep	1.645	3.775	5.056	3.24	5.02	7.38
Change in precipitation (inches)						
Mar	-0.650	-0.575	-0.988	1.491	2.901	3.781
Apr	-0.174	-0.564	-0.426	0.698	0.065	0.377
May	0.014	0.028	-0.154	0.600	0.538	0.580
Jun	-0.013	0.015	-0.025	0.012	0.012	0.094
Jul	-0.023	-0.044	-0.040	-0.008	-0.008	0.018
Aug	-0.071	-0.066	-0.097	-0.044	0.029	0.018
Sep	-0.097	-0.122	-0.170	-0.125	-0.018	0.076
Total precipitation change	-1.014	-1.328	-1.900	2.625	3.519	4.944
Year forecasted	2010	2060	2100	2010	2060	2100
Technological change	1.0	1.0	1.0	1.0	1.0	1.0
Crop						
Change in yield (% change/100)						
Corn grain	0.1171	0.1683	0.1916	0.3340	0.5098	0.6672
Corn silage	-0.2225	-0.2976	-0.3308	-0.2332	-0.3194	-0.3302
Barley	0.1659	-0.0090	-0.0047	-0.0337	-0.0140	-0.0022
Dry beans	0.2111	0.0583	0.0570	0.0907	0.1498	0.1884
Oats	0.3717	0.1792	0.1687	0.1136	0.1384	0.2245
Sugar beets	0.2442	0.1084	0.2425	0.2394	0.3101	0.3017
Winter wheat	0.0406	-0.0447	-0.0302	-0.0727	-0.0262	0.0001
Valencia orange	0.2699	-0.0387	-0.0617	0.0940	-0.0133	-0.0105
Hay alfalfa	0.2125	0.1352	0.1607	0.0966	0.1208	0.1172
Grapes (wine)	0.5322	0.1683	0.1059	0.2197	0.1259	0.0904
Tomatoes (fresh)	0.2530	0.0939	0.1304	0.0554	0.0463	0.0616
Tomatoes (processed)	0.2042	-0.0290	-0.0170	-0.0612	-0.0232	-0.0064
Almonds	0.3660	0.1646	0.1967	0.1731	0.1424	0.1809
English walnuts	0.5563	0.2002	0.1429	0.1231	0.0903	0.0636

Table 54. Percent change in yields for the coast region of California,^a by GCM Scenario, with a 1.0% technological change and CO₂ fertilizer effects, when temperature and precipitation change by month (cont.)

Crop (cont.)	PCM Scenario 2010	PCM Scenario 2060	PCM Scenario 2100	Hadley Scenario 2010	Hadley Scenario 2060	Hadley Scenario 2100
Change in yield (% change/100)						
Prunes (dried)	0.5813	0.4002	0.5842	0.3599	0.4135	0.5331
Avocados	0.2587	-0.0247	0.0103	-0.0339	-0.0617	-0.0324
Potatoes	-0.1030	-0.1681	-0.1872	-0.1606	-0.1906	-0.2078

a. This region includes Lake, Los Angeles, Monterey, Napa, Orange, San Benito, San Diego, San Luis Obispo, Santa Barbara, and Sonoma counties.

Appendix IX — Attachment

Statistical Results

SACRAMENTO VALLEY AND THE DELTA, CORN FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	323713.1	10442.36	74.77	<.0001
Error	254	35475.07	139.6656		
Corrected Total	285	359188.2			
Root MSE		11.81802	R-Square	0.90124	
Dependent Mean		123.49965	Adj R-Sq	0.88918	
Coeff Var		9.56928			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	1383.017	759.6483	1.82	0.0698
MART	1	1.954243	8.633681	0.23	0.8211
MART2	1	-0.00520	0.065297	-0.08	0.9366
APRT	1	-3.66364	4.342070	-0.84	0.3996
APRT2	1	0.035509	0.030056	1.18	0.2385
MAYT	1	7.536400	5.501044	1.37	0.1719
MAYT2	1	-0.04669	0.034507	-1.35	0.1772
JUNT	1	-1.59518	6.911215	-0.23	0.8176
JUNT2	1	0.004076	0.039414	0.10	0.9177
JULT	1	-6.65182	8.774110	-0.76	0.4491
JULT2	1	0.033734	0.047905	0.70	0.4820
AUGT	1	-10.5720	12.64106	-0.84	0.4038
AUGT2	1	0.055189	0.069067	0.80	0.4250
SEPT	1	-20.6242	10.76432	-1.92	0.0565
SEPT2	1	0.118466	0.061464	1.93	0.0550
MARP	1	5.362259	1.152045	4.65	<.0001
MARP2	1	-0.34483	0.112358	-3.07	0.0024
APRP	1	1.721679	2.193143	0.79	0.4332
APRP2	1	0.092829	0.451261	0.21	0.8372
MAYP	1	-1.39440	3.179849	-0.44	0.6614
MAYP2	1	0.079244	0.879352	0.09	0.9283
JUNP	1	-4.36181	5.306719	-0.82	0.4119
JUNP2	1	4.331024	3.573033	1.21	0.2266
JULP	1	-9.22214	16.82486	-0.55	0.5841

App. IX: Attachment

JULP2	1	11.74367	20.43270	0.57	0.5660
AUGP	1	-1.42833	9.003472	-0.16	0.8741
AUGP2	1	6.855513	9.227155	0.74	0.4582
SEPP	1	0.057278	3.743704	0.02	0.9878
SEPP2	1	-0.52010	1.368046	-0.38	0.7041
GOOD LAND	1	30.11946	14.60243	2.06	0.0402
MED LAND	1	72.42949	8.989010	8.06	<.0001
T	1	2.512605	0.089238	28.16	<.0001

SACRAMENTO VALLEY AND THE DELTA, CORN FOR SILLAGE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	1093.173	35.26364	7.14	<.0001
Error	124	612.0689	4.936040		
Corrected Total	155	1705.242			
Root MSE		2.22172	R-Square	0.64107	
Dependent Mean		23.26346	Adj R-Sq	0.55133	
Coeff Var		9.55026			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-114.505	255.7629	-0.45	0.6552
MART	1	1.414141	2.722848	0.52	0.6044
MART2	1	-0.01002	0.020660	-0.48	0.6287
APRT	1	-1.65868	2.324470	-0.71	0.4768
APRT2	1	0.012270	0.015725	0.78	0.4367
MAYT	1	3.360018	1.576317	2.13	0.0350
MAYT2	1	-0.01998	0.009904	-2.02	0.0459
JUNT	1	-2.77001	2.233618	-1.24	0.2173
JUNT2	1	0.015158	0.012700	1.19	0.2350
JULT	1	2.366580	2.887926	0.82	0.4141
JULT2	1	-0.01357	0.015742	-0.86	0.3905
AUGT	1	3.166768	4.194645	0.75	0.4517
AUGT2	1	-0.01780	0.023062	-0.77	0.4416
SEPT	1	-3.43887	2.779414	-1.24	0.2183
SEPT2	1	0.020097	0.015840	1.27	0.2069
MARP	1	0.044351	0.308995	0.14	0.8861
MARP2	1	0.001613	0.027963	0.06	0.9541
APRP	1	0.006412	0.678250	0.01	0.9925
APRP2	1	0.031861	0.154205	0.21	0.8366
MAYP	1	-0.70706	0.831059	-0.85	0.3965
MAYP2	1	0.382912	0.228418	1.68	0.0962
JUNP	1	-1.66306	1.435647	-1.16	0.2489
JUNP2	1	1.083278	0.928211	1.17	0.2454
JULP	1	-1.66175	4.469480	-0.37	0.7107

App. IX: Attachment

JULP2	1	0.326330	5.535274	0.06	0.9531
AUGP	1	-6.28100	2.795352	-2.25	0.0264
AUGP2	1	5.978299	2.359623	2.53	0.0125
SEPP	1	0.197385	1.106041	0.18	0.8587
SEPP2	1	-0.41530	0.368667	-1.13	0.2621
GOOD LAND	1	7.850081	3.756817	2.09	0.0387
MED LAND	1	12.93578	2.362212	5.48	<.0001
T	1	0.289017	0.045051	6.42	<.0001

SACRAMENTO VALLEY AND THE DELTA, Barley

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	100946.9	3256.353	13.69	<.0001
Error	848	201731.8	237.8913		
Corrected Total	879	302678.8			
Root MSE		15.42373	R-Square	0.33351	
Dependent Mean		52.50682	Adj R-Sq	0.30915	
Coeff Var		29.37471			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-38.4541	342.6620	-0.11	0.9107
MART	1	4.787650	2.634542	1.82	0.0695
MART2	1	-0.03859	0.020442	-1.89	0.0594
APRT	1	2.101899	2.191268	0.96	0.3377
APRT2	1	-0.01797	0.015552	-1.16	0.2483
MAYT	1	-4.89192	2.733063	-1.79	0.0738
MAYT2	1	0.029800	0.017312	1.72	0.0855
JUNT	1	-7.91057	3.787281	-2.09	0.0370
JUNT2	1	0.046471	0.021663	2.15	0.0322
JULT	1	0.246381	6.433306	0.04	0.9695
JULT2	1	-0.00010	0.034996	-0.00	0.9977
AUGT	1	9.348687	7.240952	1.29	0.1970
AUGT2	1	-0.04849	0.039703	-1.22	0.2223
SEPT	1	-1.66931	4.204324	-0.40	0.6914
SEPT2	1	0.003991	0.024346	0.16	0.8698
MARP	1	-0.51870	0.781881	-0.66	0.5073
MARP2	1	0.021795	0.073402	0.30	0.7666
APRP	1	-0.69879	1.613904	-0.43	0.6651
APRP2	1	-0.04922	0.333964	-0.15	0.8829
MAYP	1	-8.22035	2.158625	-3.81	0.0002
MAYP2	1	1.764664	0.629042	2.81	0.0051
JUNP	1	-0.03871	3.048619	-0.01	0.9899
JUNP2	1	-1.17602	1.559418	-0.75	0.4510
JULP	1	17.21617	6.545484	2.63	0.0087

App. IX: Attachment

JULP2	1	-8.52390	3.971627	-2.15	0.0321
AUGP	1	-1.44178	3.395678	-0.42	0.6712
AUGP2	1	1.797865	1.337019	1.34	0.1791
SEPP	1	-0.23235	2.627985	-0.09	0.9296
SEPP2	1	0.683707	0.952150	0.72	0.4729
GOOD LAND	1	6.920332	10.79520	0.64	0.5217
MED LAND	1	78.11329	6.581978	11.87	<.0001
T	1	0.531102	0.053527	9.92	<.0001

SACRAMENTO VALLEY AND THE DELTA, SORGHUM FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	5932.372	191.3668	2.41	0.0009
Error	81	6442.599	79.53826		
Corrected Total	112	12374.97			
Root MSE		8.91842	R-Square	0.47938	
Dependent Mean		81.48142	Adj R-Sq	0.28014	
Coeff Var		10.94535			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-249.263	1060.315	-0.24	0.8147
MART	1	12.61697	10.19580	1.24	0.2195
MART2	1	-0.09790	0.077149	-1.27	0.2081
APRT	1	-8.75184	8.182476	-1.07	0.2880
APRT2	1	0.060203	0.056326	1.07	0.2883
MAYT	1	-4.98821	9.515500	-0.52	0.6016
MAYT2	1	0.029785	0.059118	0.50	0.6158
JUNT	1	24.76812	10.07769	2.46	0.0161
JUNT2	1	-0.13811	0.057232	-2.41	0.0181
JULT	1	-10.3666	12.02900	-0.86	0.3913
JULT2	1	0.056234	0.065548	0.86	0.3935
AUGT	1	0.914581	25.06260	0.04	0.9710
AUGT2	1	-0.00304	0.138648	-0.02	0.9826
SEPT	1	-6.05628	12.25477	-0.49	0.6225
SEPT2	1	0.032034	0.069890	0.46	0.6479
MARP	1	-0.40655	1.895043	-0.21	0.8307
MARP2	1	0.020327	0.152253	0.13	0.8941
APRP	1	0.974089	4.072435	0.24	0.8116
APRP2	1	-0.20423	0.789821	-0.26	0.7966
MAYP	1	-0.63333	8.461529	-0.07	0.9405
MAYP2	1	-3.16999	4.368642	-0.73	0.4702
JUNP	1	3.260747	9.675296	0.34	0.7370
JUNP2	1	-1.93029	6.544063	-0.29	0.7688
JULP	1	15.13224	17.59054	0.86	0.3922

App. IX: Attachment

JULP2	1	-26.5914	19.22028	-1.38	0.1703
AUGP	1	-16.2956	11.44865	-1.42	0.1585
AUGP2	1	9.292525	9.579219	0.97	0.3349
SEPP	1	-6.23252	4.626604	-1.35	0.1817
SEPP2	1	2.034949	1.606972	1.27	0.2090
GOOD LAND	1	-57.7231	20.49058	-2.82	0.0061
MED LAND	1	0.108239	11.71175	0.01	0.9926
T	1	0.922995	0.296981	3.11	0.0026

SACRAMENTO VALLEY AND THE DELTA, DRY BEANS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	8397417	270884.4	10.08	<.0001
Error	114	3062573	26864.67		
Corrected Total	145	11459990			
Root MSE		163.90446	R-Square	0.73276	
Dependent Mean		1853.95890	Adj R-Sq	0.66009	
Coeff Var		8.84078			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	27513.20	43912.81	0.63	0.5322
MART	1	-36.7630	365.8952	-0.10	0.9201
MART2	1	0.467275	2.750828	0.17	0.8654
APRT	1	154.2688	657.5864	0.23	0.8149
APRT2	1	-1.30429	4.418751	-0.30	0.7684
MAYT	1	247.6352	203.9392	1.21	0.2272
MAYT2	1	-1.61716	1.253756	-1.29	0.1997
JUNT	1	-124.983	351.4597	-0.36	0.7228
JUNT2	1	0.820901	2.030283	0.40	0.6867
JULT	1	35.28638	470.4550	0.08	0.9403
JULT2	1	-0.51384	2.554473	-0.20	0.8409
AUGT	1	-663.874	409.9823	-1.62	0.1082
AUGT2	1	3.888544	2.261545	1.72	0.0883
SEPT	1	-46.1973	619.0347	-0.07	0.9406
SEPT2	1	0.508233	3.512174	0.14	0.8852
MARP	1	56.51872	32.82591	1.72	0.0878
MARP2	1	-4.14787	2.885717	-1.44	0.1533
APRP	1	12.47995	111.2386	0.11	0.9109
APRP2	1	16.15449	33.96577	0.48	0.6353
MAYP	1	-43.5289	81.31776	-0.54	0.5935
MAYP2	1	-0.18230	22.22276	-0.01	0.9935
JUNP	1	-216.299	166.3559	-1.30	0.1961
JUNP2	1	113.9711	92.05133	1.24	0.2182
JULP	1	-6797.27	2665.523	-2.55	0.0121

App. IX: Attachment

JULP2	1	43143.01	19750.70	2.18	0.0310
AUGP	1	-221.050	596.8279	-0.37	0.7118
AUGP2	1	-286.031	887.3108	-0.32	0.7478
SEPP	1	-107.637	136.0738	-0.79	0.4306
SEPP2	1	45.61013	39.00244	1.17	0.2447
GOOD LAND	1	703.6426	353.1995	1.99	0.0487
MED LAND	1	781.4767	233.2041	3.35	0.0011
T	1	-58.7213	10.71218	-5.48	<.0001

SACRAMENTO VALLEY AND THE DELTA, OATS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	33213.90	1071.416	8.01	<.0001
Error	196	26209.34	133.7211		
Corrected Total	227	59423.24			
Root MSE		11.56379	R-Square	0.55894	
Dependent Mean		69.06053	Adj R-Sq	0.48918	
Coeff Var		16.74442			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-463.578	1085.916	-0.43	0.6699
MART	1	-17.7525	12.03136	-1.48	0.1417
MART2	1	0.128923	0.091033	1.42	0.1583
APRT	1	19.61147	9.957229	1.97	0.0503
APRT2	1	-0.13457	0.067846	-1.98	0.0487
MAYT	1	5.489106	6.816905	0.81	0.4217
MAYT2	1	-0.03511	0.042764	-0.82	0.4126
JUNT	1	-11.9623	9.853917	-1.21	0.2262
JUNT2	1	0.067137	0.056042	1.20	0.2324
JULT	1	-14.0874	11.86513	-1.19	0.2365
JULT2	1	0.075434	0.064818	1.16	0.2459
AUGT	1	10.52097	18.05996	0.58	0.5609
AUGT2	1	-0.04776	0.099095	-0.48	0.6304
SEPT	1	16.93653	12.21891	1.39	0.1673
SEPT2	1	-0.09922	0.069924	-1.42	0.1575
MARP	1	-2.55798	1.388237	-1.84	0.0669
MARP2	1	0.119788	0.130530	0.92	0.3599
APRP	1	-2.89207	2.969305	-0.97	0.3313
APRP2	1	0.981421	0.716385	1.37	0.1723
MAYP	1	-8.54589	3.504961	-2.44	0.0157
MAYP2	1	1.193473	0.953032	1.25	0.2120
JUNP	1	6.601236	6.262962	1.05	0.2932
JUNP2	1	-0.31188	4.315205	-0.07	0.9425
JULP	1	-18.8934	20.30420	-0.93	0.3532

App. IX: Attachment

JULP2	1	18.11487	23.21405	0.78	0.4361
AUGP	1	4.223479	11.86401	0.36	0.7222
AUGP2	1	0.081085	11.07461	0.01	0.9942
SEPP	1	-0.89225	4.528666	-0.20	0.8440
SEPP2	1	-0.59151	1.499776	-0.39	0.6937
GOOD LAND	1	-0.02394	15.78842	-0.00	0.9988
MED LAND	1	35.58608	9.899091	3.59	0.0004
T	1	1.331577	0.195636	6.81	<.0001

SACRAMENTO VALLEY AND THE DELTA, WINTER WHEAT

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	147010.5	3769.499	13.12	<.0001
Error	898	258082.9	287.3975		
Corrected Total	937	405093.4			
Root MSE		16.95280	R-Square	0.36291	
Dependent Mean		56.98667	Adj R-Sq	0.33524	
Coeff Var		29.74871			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	261.2169	274.1299	0.95	0.3409
OCTT	1	1.187247	3.688694	0.32	0.7476
OCTT2	1	-0.00802	0.022419	-0.36	0.7206
NOVT	1	10.43240	4.761010	2.19	0.0287
NOVT2	1	-0.08362	0.037127	-2.25	0.0245
DECT	1	-1.53906	4.562449	-0.34	0.7359
DECT2	1	0.013902	0.041520	0.33	0.7378
JANT	1	-1.26832	6.180897	-0.21	0.8375
JANT2	1	0.009376	0.057320	0.16	0.8701
FEBT	1	1.128637	6.229827	0.18	0.8563
FEBT2	1	-0.00554	0.050989	-0.11	0.9134
MART	1	-15.1659	6.521450	-2.33	0.0203
MART2	1	0.118755	0.049797	2.38	0.0173
APRT	1	1.244122	3.792899	0.33	0.7430
APRT2	1	-0.00965	0.026324	-0.37	0.7141
MAYT	1	10.41720	4.489504	2.32	0.0205
MAYT2	1	-0.06583	0.027901	-2.36	0.0185
JUNT	1	-13.1708	5.556518	-2.37	0.0180
JUNT2	1	0.075024	0.031714	2.37	0.0182
OCTP	1	-0.68457	1.432318	-0.48	0.6328
OCTP2	1	0.179974	0.228864	0.79	0.4319
NOVP	1	0.652980	1.164606	0.56	0.5752
NOVP2	1	-0.07225	0.151917	-0.48	0.6345
DECP	1	-0.01045	0.839233	-0.01	0.9901

App. IX: Attachment

DECP2	1	-0.07724	0.082306	-0.94	0.3483
JANP	1	0.283870	0.661547	0.43	0.6680
JANP2	1	-0.01202	0.051194	-0.23	0.8143
FEBP	1	0.516241	0.656481	0.79	0.4319
FEBP2	1	-0.04307	0.060746	-0.71	0.4785
MARP	1	-0.00875	0.983965	-0.01	0.9929
MARP2	1	-0.02977	0.089443	-0.33	0.7393
APRP	1	-3.52134	1.879236	-1.87	0.0613
APRP2	1	0.597146	0.376326	1.59	0.1129
MAYP	1	-6.14424	2.587718	-2.37	0.0178
MAYP2	1	0.806291	0.814552	0.99	0.3225
JUNP	1	-4.98351	4.385130	-1.14	0.2561
JUNP2	1	1.415069	2.880309	0.49	0.6233
GOOD LAND	1	-17.1398	11.86662	-1.44	0.1490
MED LAND	1	23.26156	7.723322	3.01	0.0027
T	1	0.962159	0.061776	15.57	<.0001

SACRAMENTO VALLEY AND THE DELTA, WHEAT DURUM

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	17109.09	438.6945	8.65	<.0001
Error	58	2940.580	50.69965		
Corrected Total	97	20049.67			
Root MSE		7.12037	R-Square	0.85334	
Dependent Mean		78.48776	Adj R-Sq	0.75472	
Coeff Var		9.07195			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	7412.944	2245.501	3.30	0.0017
OCTT	1	12.74306	27.56020	0.46	0.6455
OCTT2	1	-0.03279	0.171206	-0.19	0.8488
NOVT	1	-48.8592	15.86532	-3.08	0.0032
NOVT2	1	0.344039	0.121208	2.84	0.0062
DECT	1	148.5328	23.27052	6.38	<.0001
DECT2	1	-1.35426	0.214570	-6.31	<.0001
JANT	1	-148.675	34.86012	-4.26	<.0001
JANT2	1	1.338482	0.321441	4.16	0.0001
FEBT	1	-137.845	46.78110	-2.95	0.0046
FEBT2	1	1.094316	0.380720	2.87	0.0057
MART	1	36.81543	39.91883	0.92	0.3602
MART2	1	-0.26507	0.296545	-0.89	0.3751
APRT	1	63.20642	34.26955	1.84	0.0702
APRT2	1	-0.44759	0.236755	-1.89	0.0637
MAYT	1	-48.9343	17.82095	-2.75	0.0080
MAYT2	1	0.318007	0.111268	2.86	0.0059
JUNT	1	-81.4098	22.14925	-3.68	0.0005
JUNT2	1	0.460196	0.124533	3.70	0.0005
OCTP	1	-27.1504	12.00141	-2.26	0.0274
OCTP2	1	14.90377	5.753960	2.59	0.0121
NOVP	1	6.035439	7.161937	0.84	0.4029
NOVP2	1	-0.98605	0.969938	-1.02	0.3136
DECP	1	-28.8350	6.218017	-4.64	<.0001

App. IX: Attachment

DECP2	1	4.589222	0.748620	6.13	<.0001
JANP	1	-8.92954	2.878175	-3.10	0.0030
JANP2	1	1.276994	0.312729	4.08	0.0001
FEBP	1	-17.6045	5.179367	-3.40	0.0012
FEBP2	1	1.840578	0.464565	3.96	0.0002
MARP	1	9.434494	6.922464	1.36	0.1782
MARP2	1	-2.13113	1.158973	-1.84	0.0711
APRP	1	-43.4156	13.06902	-3.32	0.0016
APRP2	1	8.681123	3.772547	2.30	0.0250
MAYP	1	6.346156	13.43912	0.47	0.6385
MAYP2	1	-3.09081	3.665928	-0.84	0.4026
JUNP	1	-72.2532	48.64886	-1.49	0.1429
JUNP2	1	26.20965	85.21246	0.31	0.7595
GOOD LAND	1	104.9655	44.64566	2.35	0.0221
MED LAND	1	97.44756	34.52767	2.82	0.0065
T	1	-0.64501	0.557739	-1.16	0.2522

SACRAMENTO VALLEY AND THE DELTA, RICE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	5.0929E8	16428828	83.29	<.0001
Error	208	41028593	197252.8		
Corrected Total	239	5.5032E8			
Root MSE		444.13157	R-Square	0.92545	
Dependent Mean		6005.60417	Adj R-Sq	0.91433	
Coeff Var		7.39529			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-56038.7	38068.25	-1.47	0.1425
MART	1	-647.851	329.0045	-1.97	0.0503
MART2	1	4.898017	2.509934	1.95	0.0523
APRT	1	-45.2579	169.0550	-0.27	0.7892
APRT2	1	0.412509	1.178707	0.35	0.7267
MAYT	1	736.9188	262.1848	2.81	0.0054
MAYT2	1	-4.49777	1.630931	-2.76	0.0063
JUNT	1	-515.139	378.8698	-1.36	0.1754
JUNT2	1	2.896776	2.133574	1.36	0.1760
JULT	1	888.6606	507.9452	1.75	0.0817
JULT2	1	-4.81687	2.729042	-1.77	0.0790
AUGT	1	1700.936	503.6522	3.38	0.0009
AUGT2	1	-8.87996	2.742966	-3.24	0.0014
SEPT	1	-1189.53	505.6390	-2.35	0.0196
SEPT2	1	6.967963	2.880392	2.42	0.0164
MARP	1	0.842044	46.89413	0.02	0.9857
MARP2	1	1.063810	4.506071	0.24	0.8136
APRP	1	-315.701	88.73893	-3.56	0.0005
APRP2	1	27.42895	19.48668	1.41	0.1607
MAYP	1	165.2325	122.9893	1.34	0.1806
MAYP2	1	-77.4788	36.41950	-2.13	0.0346
JUNP	1	310.7606	215.1439	1.44	0.1501
JUNP2	1	-104.366	139.6866	-0.75	0.4558
JULP	1	1091.591	694.8132	1.57	0.1177

App. IX: Attachment

JULP2	1	-1794.37	839.4045	-2.14	0.0337
AUGP	1	-795.884	371.4789	-2.14	0.0333
AUGP2	1	1126.050	375.3955	3.00	0.0030
SEPP	1	229.0163	157.8663	1.45	0.1484
SEPP2	1	-37.7098	56.25432	-0.67	0.5034
GOOD LAND	1	-1978.38	657.4888	-3.01	0.0029
MED LAND	1	-1197.44	441.3379	-2.71	0.0072
T	1	94.03971	3.093072	30.40	<.0001

SACRAMENTO VALLEY AND THE DELTA, SUGARBEETS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	867.7917	27.99328	2.99	<.0001
Error	126	1180.007	9.365135		
Corrected Total	157	2047.799			
Root MSE		3.06025	R-Square	0.42377	
Dependent Mean		25.07468	Adj R-Sq	0.28200	
Coeff Var		12.20454			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	290.0272	308.3207	0.94	0.3487
MART	1	1.958649	3.668991	0.53	0.5944
MART2	1	-0.01625	0.027956	-0.58	0.5622
APRT	1	1.087891	2.823242	0.39	0.7006
APRT2	1	-0.00432	0.019226	-0.22	0.8228
MAYT	1	0.290438	2.090727	0.14	0.8897
MAYT2	1	-0.00252	0.013179	-0.19	0.8485
JUNT	1	6.107066	2.844066	2.15	0.0337
JUNT2	1	-0.03420	0.016152	-2.12	0.0362
JULT	1	4.952187	3.736107	1.33	0.1874
JULT2	1	-0.02819	0.020356	-1.38	0.1686
AUGT	1	-15.8413	5.618792	-2.82	0.0056
AUGT2	1	0.085517	0.030885	2.77	0.0065
SEPT	1	-3.82989	3.711288	-1.03	0.3041
SEPT2	1	0.023553	0.021187	1.11	0.2684
MARP	1	-0.11581	0.429161	-0.27	0.7877
MARP2	1	-0.01591	0.038542	-0.41	0.6804
APRP	1	3.206165	0.905872	3.54	0.0006
APRP2	1	-0.63313	0.206844	-3.06	0.0027
MAYP	1	-0.21666	1.196566	-0.18	0.8566
MAYP2	1	-0.18710	0.333214	-0.56	0.5755
JUNP	1	-3.31353	2.048452	-1.62	0.1083
JUNP2	1	2.201365	1.289859	1.71	0.0903
JULP	1	-3.83871	8.838332	-0.43	0.6648

App. IX: Attachment

JULP2	1	7.358271	18.42880	0.40	0.6904
AUGP	1	2.777278	3.353110	0.83	0.4091
AUGP2	1	-1.29558	3.023015	-0.43	0.6690
SEPP	1	-1.05919	1.443287	-0.73	0.4644
SEPP2	1	0.618140	0.494198	1.25	0.2133
GOOD LAND	1	7.393868	5.111305	1.45	0.1505
MED LAND	1	-0.32220	3.368728	-0.10	0.9240
T	1	0.092195	0.064168	1.44	0.1533

SJ VALLEY AND DESERT, CORN FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	336925.7	10868.57	36.97	<.0001
Error	263	77325.17	294.0121		
Corrected Total	294	414250.8			
Root MSE		17.14678	R-Square	0.81334	
Dependent Mean		108.85119	Adj R-Sq	0.79134	
Coeff Var		15.75250			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-1621.10	696.1669	-2.33	0.0206
MART	1	8.186529	4.575301	1.79	0.0747
MART2	1	-0.05353	0.031766	-1.69	0.0931
APRT	1	-3.40527	4.222123	-0.81	0.4207
APRT2	1	0.027192	0.026961	1.01	0.3141
MAYT	1	3.706744	6.293944	0.59	0.5564
MAYT2	1	-0.02176	0.037092	-0.59	0.5579
JUNT	1	-3.43664	7.371763	-0.47	0.6415
JUNT2	1	0.014141	0.039212	0.36	0.7187
JULT	1	5.429821	13.54267	0.40	0.6888
JULT2	1	-0.03091	0.069402	-0.45	0.6564
AUGT	1	21.25314	10.45111	2.03	0.0430
AUGT2	1	-0.10978	0.054120	-2.03	0.0435
SEPT	1	2.550221	9.048779	0.28	0.7783
SEPT2	1	-0.01541	0.049432	-0.31	0.7555
MARP	1	-2.02564	2.436510	-0.83	0.4065
MARP2	1	0.517927	0.409883	1.26	0.2075
APRP	1	-0.67215	3.500273	-0.19	0.8479
APRP2	1	0.115657	0.875612	0.13	0.8950
MAYP	1	2.465151	5.207988	0.47	0.6364
MAYP2	1	-3.18188	1.869946	-1.70	0.0900
JUNP	1	6.141276	10.33888	0.59	0.5530
JUNP2	1	-4.31427	7.340947	-0.59	0.5572
JULP	1	-5.47081	16.89990	-0.32	0.7464

App. IX: Attachment

JULP2	1	3.692339	14.36273	0.26	0.7973
AUGP	1	16.82203	8.164019	2.06	0.0403
AUGP2	1	-6.20189	2.619092	-2.37	0.0186
SEPP	1	-1.72937	4.917949	-0.35	0.7254
SEPP2	1	-0.34231	1.757399	-0.19	0.8457
GOOD LAND	1	-13.8454	11.42726	-1.21	0.2267
MED LAND	1	-2.76057	16.45239	-0.17	0.8669
T	1	2.591769	0.104642	24.77	<.0001

SJ VALLEY AND DESERT, CORN FOR SILLAGE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	1441.791	46.50938	5.25	<.0001
Error	141	1248.841	8.857030		
Corrected Total	172	2690.632			
Root MSE		2.97608	R-Square	0.53586	
Dependent Mean		23.41272	Adj R-Sq	0.43381	
Coeff Var		12.71137			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-83.2661	162.5337	-0.51	0.6092
MART	1	-0.97590	1.386325	-0.70	0.4826
MART2	1	0.008891	0.009739	0.91	0.3628
APRT	1	0.874954	1.415133	0.62	0.5374
APRT2	1	-0.00312	0.008939	-0.35	0.7280
MAYT	1	5.568504	1.521281	3.66	0.0004
MAYT2	1	-0.03284	0.008988	-3.65	0.0004
JUNT	1	-4.83273	2.089917	-2.31	0.0222
JUNT2	1	0.025598	0.011209	2.28	0.0239
JULT	1	9.406714	3.415043	2.75	0.0067
JULT2	1	-0.04931	0.017577	-2.81	0.0057
AUGT	1	-6.09916	2.973365	-2.05	0.0421
AUGT2	1	0.030501	0.015595	1.96	0.0525
SEPT	1	-2.03075	2.126448	-0.95	0.3412
SEPT2	1	0.011507	0.011669	0.99	0.3258
MARP	1	1.529699	0.632263	2.42	0.0168
MARP2	1	-0.14980	0.098301	-1.52	0.1298
APRP	1	0.516689	1.161517	0.44	0.6571
APRP2	1	-0.15740	0.402894	-0.39	0.6966
MAYP	1	-0.16661	1.134730	-0.15	0.8835
MAYP2	1	0.419559	0.370170	1.13	0.2590
JUNP	1	0.151613	2.155056	0.07	0.9440
JUNP2	1	-0.95124	1.401157	-0.68	0.4983
JULP	1	-0.10491	3.685261	-0.03	0.9773

App. IX: Attachment

JULP2	1	0.267234	3.036091	0.09	0.9300
AUGP	1	-2.85122	1.866019	-1.53	0.1288
AUGP2	1	0.939436	0.566696	1.66	0.0996
SEPP	1	-2.05335	1.234594	-1.66	0.0985
SEPP2	1	0.638953	0.380837	1.68	0.0956
GOOD LAND	1	-0.27573	2.597749	-0.11	0.9156
MED LAND	1	-0.13972	3.739336	-0.04	0.9702
T	1	0.214899	0.043769	4.91	<.0001

SJ VALLEY AND DESERT, Barley

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	109887.6	3544.761	9.21	<.0001
Error	902	347321.2	385.0568		
Corrected Total	933	457208.8			
Root MSE		19.62286	R-Square	0.24034	
Dependent Mean		52.42334	Adj R-Sq	0.21424	
Coeff Var		37.43154			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-192.691	401.0382	-0.48	0.6310
MART	1	4.935653	2.860943	1.73	0.0848
MART2	1	-0.04091	0.019809	-2.07	0.0392
APRT	1	1.801529	2.938769	0.61	0.5400
APRT2	1	-0.01574	0.018884	-0.83	0.4048
MAYT	1	2.071635	3.985209	0.52	0.6033
MAYT2	1	-0.01016	0.023425	-0.43	0.6647
JUNT	1	-7.97763	4.851230	-1.64	0.1004
JUNT2	1	0.044671	0.025901	1.72	0.0849
JULT	1	-10.0737	8.197412	-1.23	0.2194
JULT2	1	0.050071	0.042057	1.19	0.2341
AUGT	1	15.80238	6.345951	2.49	0.0129
AUGT2	1	-0.07747	0.032973	-2.35	0.0190
SEPT	1	-0.42982	4.909732	-0.09	0.9303
SEPT2	1	-0.00226	0.026797	-0.08	0.9330
MARP	1	-5.58131	1.588794	-3.51	0.0005
MARP2	1	0.856470	0.266638	3.21	0.0014
APRP	1	-4.08531	2.389780	-1.71	0.0877
APRP2	1	0.048262	0.670062	0.07	0.9426
MAYP	1	1.272319	3.494703	0.36	0.7159
MAYP2	1	-0.11017	1.376006	-0.08	0.9362
JUNP	1	10.01283	6.466367	1.55	0.1219
JUNP2	1	-4.96147	4.590495	-1.08	0.2801
JULP	1	21.75176	11.70878	1.86	0.0635

App. IX: Attachment

JULP2	1	-13.6240	8.657309	-1.57	0.1159
AUGP	1	1.713047	4.664165	0.37	0.7135
AUGP2	1	-1.48398	1.396230	-1.06	0.2881
SEPP	1	-2.84833	3.101491	-0.92	0.3587
SEPP2	1	-0.39591	1.007383	-0.39	0.6944
GOOD LAND	1	53.29115	7.301744	7.30	<.0001
MED LAND	1	40.01514	10.40361	3.85	0.0001
T	1	0.518402	0.057308	9.05	<.0001

SJ VALLEY AND DESERT, SORGHUM FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	5337.950	172.1919	2.78	0.0001
Error	87	5383.950	61.88448		
Corrected Total	118	10721.90			
Root MSE		7.86667	R-Square	0.49785	
Dependent Mean		74.92437	Adj R-Sq	0.31893	
Coeff Var		10.49948			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	234.1867	547.0156	0.43	0.6696
MART	1	4.272676	3.551633	1.20	0.2322
MART2	1	-0.02932	0.024350	-1.20	0.2318
APRT	1	-2.17901	4.426685	-0.49	0.6238
APRT2	1	0.016148	0.028322	0.57	0.5700
MAYT	1	0.541275	6.931573	0.08	0.9379
MAYT2	1	-0.00096	0.040301	-0.02	0.9810
JUNT	1	-1.26221	6.355739	-0.20	0.8430
JUNT2	1	0.004568	0.033579	0.14	0.8921
JULT	1	-8.95008	9.401459	-0.95	0.3437
JULT2	1	0.041841	0.047577	0.88	0.3816
AUGT	1	0.814928	8.424039	0.10	0.9232
AUGT2	1	-0.00363	0.043677	-0.08	0.9340
SEPT	1	4.113428	5.956651	0.69	0.4917
SEPT2	1	-0.02472	0.032418	-0.76	0.4478
MARP	1	-3.45482	2.428682	-1.42	0.1585
MARP2	1	0.733450	0.419205	1.75	0.0837
APRP	1	0.584547	4.085014	0.14	0.8865
APRP2	1	-0.36558	1.272626	-0.29	0.7746
MAYP	1	-3.33376	11.35626	-0.29	0.7698
MAYP2	1	0.148924	12.47055	0.01	0.9905
JUNP	1	3.304442	12.72759	0.26	0.7958
JUNP2	1	-1.28440	14.74972	-0.09	0.9308
JULP	1	13.51705	11.47271	1.18	0.2419

App. IX: Attachment

JULP2	1	-12.4897	8.573430	-1.46	0.1488
AUGP	1	10.52458	5.503777	1.91	0.0591
AUGP2	1	-2.76723	1.554323	-1.78	0.0785
SEPP	1	-6.29116	3.919051	-1.61	0.1121
SEPP2	1	0.775387	1.128064	0.69	0.4937
GOOD LAND	1	3.636456	8.668938	0.42	0.6759
MED LAND	1	-17.0120	12.83488	-1.33	0.1885
T	1	0.809440	0.205072	3.95	0.0002

SJ VALLEY AND DESERT, COTTON PIMA

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	5267792	169928.8	6.80	<.0001
Error	36	899018.8	24972.74		
Corrected Total	67	6166811			
Root MSE		158.02767	R-Square	0.85422	
Dependent Mean		978.95588	Adj R-Sq	0.72868	
Coeff Var		16.14247			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-20149.1	32566.42	-0.62	0.5400
MART	1	-57.7738	135.4741	-0.43	0.6723
MART2	1	0.261234	0.891648	0.29	0.7712
APRT	1	47.50202	267.3759	0.18	0.8600
APRT2	1	-0.12585	1.610490	-0.08	0.9381
MAYT	1	260.8954	269.4016	0.97	0.3393
MAYT2	1	-1.46606	1.538630	-0.95	0.3470
JUNT	1	209.3834	247.4547	0.85	0.4031
JUNT2	1	-1.05861	1.270566	-0.83	0.4102
JULT	1	258.9022	440.8715	0.59	0.5607
JULT2	1	-1.37899	2.208149	-0.62	0.5362
AUGT	1	-199.623	654.3385	-0.31	0.7621
AUGT2	1	0.928272	3.359843	0.28	0.7839
SEPT	1	-112.693	531.3880	-0.21	0.8332
SEPT2	1	0.681072	2.829922	0.24	0.8112
MARP	1	-2.14118	66.36210	-0.03	0.9744
MARP2	1	-0.03372	9.101738	-0.00	0.9971
APRP	1	-179.246	226.5053	-0.79	0.4339
APRP2	1	111.4844	114.3512	0.97	0.3361
MAYP	1	219.6858	194.3706	1.13	0.2658
MAYP2	1	-4.63594	94.44453	-0.05	0.9611
JUNP	1	69.12767	257.8537	0.27	0.7902
JUNP2	1	44.88994	131.9394	0.34	0.7357
JULP	1	700.5429	1330.466	0.53	0.6017

App. IX: Attachment

JULP2	1	-933.252	3343.992	-0.28	0.7818
AUGP	1	-337.696	265.3784	-1.27	0.2114
AUGP2	1	53.41053	66.38454	0.80	0.4264
SEPP	1	-25.8669	246.5169	-0.10	0.9170
SEPP2	1	15.30670	96.14290	0.16	0.8744
GOOD LAND	1	-104.216	346.7054	-0.30	0.7655
MED LAND	1	-686.058	474.1978	-1.45	0.1566
T	1	26.61543	10.47023	2.54	0.0155

SJ VALLEY AND DESERT, COTTON

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	26858176	866392.8	24.19	<.0001
Error	390	13968519	35816.72		
Corrected Total	421	40826695			
Root MSE		189.25305	R-Square	0.65786	
Dependent Mean		928.24882	Adj R-Sq	0.63066	
Coeff Var		20.38818			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-22823.6	5582.530	-4.09	<.0001
MART	1	12.67720	36.88773	0.34	0.7313
MART2	1	-0.19691	0.251314	-0.78	0.4338
APRT	1	16.04370	36.53722	0.44	0.6608
APRT2	1	-0.05676	0.232269	-0.24	0.8071
MAYT	1	126.0071	49.92800	2.52	0.0120
MAYT2	1	-0.72673	0.289123	-2.51	0.0124
JUNT	1	12.99694	57.36515	0.23	0.8209
JUNT2	1	-0.02299	0.303738	-0.08	0.9397
JULT	1	99.41154	110.1611	0.90	0.3674
JULT2	1	-0.51392	0.560559	-0.92	0.3598
AUGT	1	152.7724	85.22714	1.79	0.0738
AUGT2	1	-0.78413	0.438524	-1.79	0.0745
SEPT	1	79.59063	60.82849	1.31	0.1915
SEPT2	1	-0.43009	0.327483	-1.31	0.1898
MARP	1	-108.392	22.53379	-4.81	<.0001
MARP2	1	13.36212	3.900608	3.43	0.0007
APRP	1	-10.7274	31.74035	-0.34	0.7356
APRP2	1	5.900908	7.743124	0.76	0.4465
MAYP	1	1.025193	63.22703	0.02	0.9871
MAYP2	1	-5.33135	32.99996	-0.16	0.8717
JUNP	1	79.24568	101.5673	0.78	0.4357
JUNP2	1	-36.3463	75.94166	-0.48	0.6325
JULP	1	84.30885	139.6687	0.60	0.5464

App. IX: Attachment

JULP2	1	-28.2913	97.21977	-0.29	0.7712
AUGP	1	-27.5466	65.30036	-0.42	0.6734
AUGP2	1	-32.6510	20.84887	-1.57	0.1181
SEPP	1	41.17324	31.77210	1.30	0.1958
SEPP2	1	-8.30345	4.542939	-1.83	0.0683
GOOD LAND	1	28.82436	107.4846	0.27	0.7887
MED LAND	1	-748.035	151.0428	-4.95	<.0001
T	1	12.19132	0.615656	19.80	<.0001

SJ VALLEY AND DESERT, DRY BEANS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	11705083	377583.3	7.59	<.0001
Error	124	6170490	49762.01		
Corrected Total	155	17875572			
Root MSE		223.07401	R-Square	0.65481	
Dependent Mean		1978.84615	Adj R-Sq	0.56851	
Coeff Var		11.27293			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-10188.3	18299.62	-0.56	0.5787
MART	1	78.63597	189.7934	0.41	0.6794
MART2	1	-0.82507	1.343274	-0.61	0.5402
APRT	1	-575.305	195.6816	-2.94	0.0039
APRT2	1	3.164562	1.227860	2.58	0.0111
MAYT	1	789.0331	231.5995	3.41	0.0009
MAYT2	1	-4.42682	1.344866	-3.29	0.0013
JUNT	1	-1257.23	251.0300	-5.01	<.0001
JUNT2	1	6.887614	1.336186	5.15	<.0001
JULT	1	1611.792	382.9856	4.21	<.0001
JULT2	1	-8.24937	1.948063	-4.23	<.0001
AUGT	1	360.3188	278.2827	1.29	0.1978
AUGT2	1	-1.60737	1.426149	-1.13	0.2619
SEPT	1	-701.274	327.7867	-2.14	0.0344
SEPT2	1	3.510653	1.733540	2.03	0.0450
MARP	1	-11.5948	67.11156	-0.17	0.8631
MARP2	1	-2.84230	9.212908	-0.31	0.7582
APRP	1	-589.916	168.6689	-3.50	0.0007
APRP2	1	314.6286	72.88516	4.32	<.0001
MAYP	1	262.2800	102.3292	2.56	0.0116
MAYP2	1	-52.3459	28.44241	-1.84	0.0681
JUNP	1	-21.8273	213.4467	-0.10	0.9187
JUNP2	1	-21.5529	114.1940	-0.19	0.8506
JULP	1	2461.388	3606.800	0.68	0.4962

App. IX: Attachment

JULP2	1	-4405.92	15456.19	-0.29	0.7761
AUGP	1	1301.033	1140.660	1.14	0.2562
AUGP2	1	-1110.14	1285.428	-0.86	0.3895
SEPP	1	912.3187	266.1418	3.43	0.0008
SEPP2	1	-823.761	222.0708	-3.71	0.0003
GOOD LAND	1	-1498.45	274.2370	-5.46	<.0001
MED LAND	1	-2021.27	339.8282	-5.95	<.0001
T	1	-41.1243	15.69301	-2.62	0.0099

SJ VALLEY AND DESERT, OATS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	109757.6	3540.569	15.76	<.0001
Error	216	48512.15	224.5933		
Corrected Total	247	158269.8			
Root MSE		14.98644	R-Square	0.69348	
Dependent Mean		72.03427	Adj R-Sq	0.64949	
Coeff Var		20.80459			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-3303.98	692.0260	-4.77	<.0001
MART	1	6.100964	5.312346	1.15	0.2521
MART2	1	-0.04675	0.036752	-1.27	0.2047
APRT	1	14.09172	5.257559	2.68	0.0079
APRT2	1	-0.08896	0.033390	-2.66	0.0083
MAYT	1	24.18776	6.479008	3.73	0.0002
MAYT2	1	-0.14004	0.038176	-3.67	0.0003
JUNT	1	-21.6966	8.729224	-2.49	0.0137
JUNT2	1	0.109404	0.046616	2.35	0.0198
JULT	1	14.63669	14.50061	1.01	0.3139
JULT2	1	-0.07338	0.074733	-0.98	0.3272
AUGT	1	25.65616	12.31387	2.08	0.0384
AUGT2	1	-0.12759	0.064146	-1.99	0.0480
SEPT	1	11.93194	8.452171	1.41	0.1595
SEPT2	1	-0.07084	0.046290	-1.53	0.1274
MARP	1	-1.85271	2.650875	-0.70	0.4854
MARP2	1	0.366994	0.425927	0.86	0.3898
APRP	1	5.287179	5.265747	1.00	0.3165
APRP2	1	-2.27481	1.895633	-1.20	0.2314
MAYP	1	-2.01677	4.703820	-0.43	0.6685
MAYP2	1	0.876606	1.460438	0.60	0.5490
JUNP	1	0.464014	9.338630	0.05	0.9604
JUNP2	1	-0.96989	5.729710	-0.17	0.8657
JULP	1	-19.0139	16.97975	-1.12	0.2640

App. IX: Attachment

JULP2	1	17.42087	14.07964	1.24	0.2173
AUGP	1	13.60310	8.018939	1.70	0.0913
AUGP2	1	-3.14417	2.515607	-1.25	0.2127
SEPP	1	-2.59763	4.968292	-0.52	0.6016
SEPP2	1	-0.21238	1.666424	-0.13	0.8987
GOOD LAND	1	21.14138	10.99262	1.92	0.0558
MED LAND	1	4.758413	15.84568	0.30	0.7642
T	1	1.494357	0.175553	8.51	<.0001

SJ VALLEY AND DESERT, WINTER WHEAT

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	198456.6	5088.630	11.54	<.0001
Error	940	414332.2	440.7789		
Corrected Total	979	612788.8			
Root MSE		20.99474	R-Square	0.32386	
Dependent Mean		54.57969	Adj R-Sq	0.29581	
Coeff Var		38.46620			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-395.196	298.5822	-1.32	0.1860
OCTT	1	3.520980	3.979096	0.88	0.3765
OCTT2	1	-0.02518	0.023713	-1.06	0.2885
NOVT	1	4.116403	3.035472	1.36	0.1754
NOVT2	1	-0.02613	0.021934	-1.19	0.2339
DECT	1	-2.65967	2.081272	-1.28	0.2016
DECT2	1	0.020011	0.017414	1.15	0.2508
JANT	1	0.326600	1.958883	0.17	0.8676
JANT2	1	-0.00253	0.016484	-0.15	0.8781
FEBT	1	7.324661	3.128578	2.34	0.0194
FEBT2	1	-0.04970	0.023218	-2.14	0.0326
MART	1	2.560947	3.799484	0.67	0.5005
MART2	1	-0.02233	0.026269	-0.85	0.3956
APRT	1	12.79219	3.056867	4.18	<.0001
APRT2	1	-0.08106	0.019559	-4.14	<.0001
MAYT	1	-2.16008	4.333534	-0.50	0.6183
MAYT2	1	0.012646	0.025283	0.50	0.6171
JUNT	1	-12.7110	4.766770	-2.67	0.0078
JUNT2	1	0.068876	0.025398	2.71	0.0068
OCTP	1	-2.28402	3.366532	-0.68	0.4977
OCTP2	1	-0.05640	1.366053	-0.04	0.9671
NOVP	1	4.610557	2.329778	1.98	0.0481
NOVP2	1	-0.93367	0.611449	-1.53	0.1271
DECP	1	-0.72996	2.004917	-0.36	0.7159

App. IX: Attachment

DECP2	1	-0.08803	0.432829	-0.20	0.8389
JANP	1	0.029889	1.515848	0.02	0.9843
JANP2	1	0.029857	0.257954	0.12	0.9079
FEBP	1	3.976193	1.747982	2.27	0.0231
FEBP2	1	-0.71615	0.330057	-2.17	0.0303
MARP	1	0.576113	1.680380	0.34	0.7318
MARP2	1	-0.07763	0.268730	-0.29	0.7728
APRP	1	-2.17983	2.719286	-0.80	0.4230
APRP2	1	0.647183	0.751598	0.86	0.3894
MAYP	1	-5.22262	4.180739	-1.25	0.2119
MAYP2	1	1.481674	1.745231	0.85	0.3961
JUNP	1	-7.53372	7.297419	-1.03	0.3022
JUNP2	1	2.386839	5.001956	0.48	0.6333
GOOD LAND	1	18.72832	7.987954	2.34	0.0193
MED LAND	1	2.300207	12.67281	0.18	0.8560
T	1	0.975453	0.063704	15.31	<.0001

SJ VALLEY AND DESERT, WHEAT DURUM

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	18410.60	472.0667	8.65	<.0001
Error	186	10151.12	54.57592		
Corrected Total	225	28561.72			
Root MSE		7.38755	R-Square	0.64459	
Dependent Mean		86.54779	Adj R-Sq	0.57007	
Coeff Var		8.53581			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-870.248	302.7383	-2.87	0.0045
OCTT	1	-0.51890	3.592461	-0.14	0.8853
OCTT2	1	0.003713	0.021263	0.17	0.8616
NOVT	1	7.289699	3.129139	2.33	0.0209
NOVT2	1	-0.04993	0.022111	-2.26	0.0251
DECT	1	-1.69690	2.068366	-0.82	0.4130
DECT2	1	0.014629	0.017054	0.86	0.3921
JANT	1	-2.03506	1.890757	-1.08	0.2832
JANT2	1	0.007043	0.015764	0.45	0.6556
FEBT	1	-5.08087	3.424060	-1.48	0.1395
FEBT2	1	0.039490	0.024804	1.59	0.1131
MART	1	2.199397	3.630067	0.61	0.5453
MART2	1	-0.01570	0.024216	-0.65	0.5176
APRT	1	1.932892	2.995255	0.65	0.5195
APRT2	1	-0.01319	0.018324	-0.72	0.4726
MAYT	1	2.167039	3.800901	0.57	0.5693
MAYT2	1	-0.00824	0.021775	-0.38	0.7054
JUNT	1	13.01456	4.932346	2.64	0.0090
JUNT2	1	-0.06352	0.025799	-2.46	0.0147
OCTP	1	-3.33333	3.183195	-1.05	0.2964
OCTP2	1	1.608272	1.041738	1.54	0.1243
NOVP	1	1.815284	2.081314	0.87	0.3842
NOVP2	1	-0.34687	0.550127	-0.63	0.5291
DECP	1	6.200301	2.061491	3.01	0.0030

App. IX: Attachment

DECP2	1	-1.25294	0.439505	-2.85	0.0049
JANP	1	-4.68988	1.910790	-2.45	0.0150
JANP2	1	0.299198	0.343357	0.87	0.3847
FEBP	1	-4.24210	1.569844	-2.70	0.0075
FEBP2	1	0.710659	0.283938	2.50	0.0132
MARP	1	-1.89563	1.948229	-0.97	0.3318
MARP2	1	0.421811	0.331120	1.27	0.2043
APRP	1	10.75398	3.234528	3.32	0.0011
APRP2	1	-1.49779	1.005188	-1.49	0.1379
MAYP	1	2.272027	5.380989	0.42	0.6733
MAYP2	1	0.793801	3.079191	0.26	0.7968
JUNP	1	-1.70368	6.502285	-0.26	0.7936
JUNP2	1	3.661519	3.395637	1.08	0.2823
GOOD LAND	1	-6.78733	6.978864	-0.97	0.3320
MED LAND	1	-37.1497	11.18215	-3.32	0.0011
T	1	1.095651	0.108432	10.10	<.0001

SJ VALLEY AND DESERT, RICE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	4.4619E8	14393075	23.93	<.0001
Error	202	1.215E8	601466.6		
Corrected Total	233	5.6768E8			
Root MSE		775.54278	R-Square	0.78598	
Dependent Mean		4892.65385	Adj R-Sq	0.75313	
Coeff Var		15.85117			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-27592.1	47292.93	-0.58	0.5603
MART	1	751.5331	450.1867	1.67	0.0966
MART2	1	-5.19151	3.291104	-1.58	0.1163
APRT	1	5.197063	268.3450	0.02	0.9846
APRT2	1	0.034310	1.784548	0.02	0.9847
MAYT	1	1128.049	466.0820	2.42	0.0164
MAYT2	1	-6.62280	2.787772	-2.38	0.0185
JUNT	1	-980.247	636.9720	-1.54	0.1254
JUNT2	1	5.301434	3.467803	1.53	0.1279
JULT	1	964.2913	924.0709	1.04	0.2980
JULT2	1	-5.23479	4.772559	-1.10	0.2740
AUGT	1	-821.960	845.4143	-0.97	0.3321
AUGT2	1	4.229795	4.453282	0.95	0.3433
SEPT	1	-184.374	634.3067	-0.29	0.7716
SEPT2	1	0.826739	3.494454	0.24	0.8132
MARP	1	-64.5515	122.0702	-0.53	0.5975
MARP2	1	24.43481	20.41087	1.20	0.2327
APRP	1	-340.767	177.2093	-1.92	0.0559
APRP2	1	75.91423	41.01229	1.85	0.0656
MAYP	1	329.5697	238.9556	1.38	0.1694
MAYP2	1	-75.2295	91.85076	-0.82	0.4137
JUNP	1	-764.868	498.6508	-1.53	0.1266
JUNP2	1	357.4681	352.4499	1.01	0.3117
JULP	1	1643.666	2023.910	0.81	0.4177

App. IX: Attachment

JULP2	1	-1596.68	3831.432	-0.42	0.6773
AUGP	1	355.0461	1108.189	0.32	0.7490
AUGP2	1	-1231.85	1188.572	-1.04	0.3012
SEPP	1	-1112.76	410.9734	-2.71	0.0074
SEPP2	1	401.1663	230.9295	1.74	0.0839
GOOD LAND	1	956.3954	578.1060	1.65	0.0996
MED LAND	1	2301.815	857.9881	2.68	0.0079
T	1	95.85978	4.920758	19.48	<.0001

SJ VALLEY AND DESERT, SUGARBEETS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	1155.410	37.27130	2.92	<.0001
Error	133	1698.741	12.77249		
Corrected Total	164	2854.151			
Root MSE		3.57386	R-Square	0.40482	
Dependent Mean		27.34727	Adj R-Sq	0.26609	
Coeff Var		13.06844			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	27.31826	204.3218	0.13	0.8938
MART	1	-0.21803	1.840444	-0.12	0.9059
MART2	1	0.002130	0.013029	0.16	0.8704
APRT	1	-0.47885	1.667917	-0.29	0.7745
APRT2	1	0.003021	0.010638	0.28	0.7769
MAYT	1	-0.61651	2.054633	-0.30	0.7646
MAYT2	1	0.0003280	0.012194	0.27	0.7884
JUNT	1	3.506063	2.720251	1.29	0.1997
JUNT2	1	-0.01825	0.014588	-1.25	0.2130
JULT	1	4.089890	4.589140	0.89	0.3744
JULT2	1	-0.02185	0.023767	-0.92	0.3596
AUGT	1	-8.51095	3.283921	-2.59	0.0106
AUGT2	1	0.042573	0.017099	2.49	0.0140
SEPT	1	1.952161	2.368194	0.82	0.4112
SEPT2	1	-0.01016	0.012975	-0.78	0.4351
MARP	1	1.136761	0.724086	1.57	0.1188
MARP2	1	-0.24651	0.113541	-2.17	0.0317
APRP	1	1.722390	1.471146	1.17	0.2438
APRP2	1	-0.63861	0.512858	-1.25	0.2152
MAYP	1	-2.47460	1.993125	-1.24	0.2166
MAYP2	1	0.831727	0.905987	0.92	0.3603
JUNP	1	1.136986	2.755913	0.41	0.6806
JUNP2	1	-1.88438	1.745286	-1.08	0.2822
JULP	1	-5.15632	9.083607	-0.57	0.5712

App. IX: Attachment

JULP2	1	9.159176	14.57761	0.63	0.5309
AUGP	1	-1.72857	2.170781	-0.80	0.4273
AUGP2	1	0.253189	0.599253	0.42	0.6733
SEPP	1	-1.61360	1.404712	-1.15	0.2527
SEPP2	1	0.539342	0.437812	1.23	0.2202
GOOD LAND	1	14.44146	3.296469	4.38	<.0001
MED LAND	1	2.397752	4.695843	0.51	0.6105
T	1	0.193788	0.055712	3.48	0.0007

NORTH EAST REGION AND MOUNTAIN AREA, CORN FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	86582.14	2792.972	4.19	0.0143
Error	9	5994.015	666.0017		
Corrected Total	40	92576.16			
Root MSE		25.80701	R-Square	0.93525	
Dependent Mean		99.53659	Adj R-Sq	0.71224	
Coeff Var		25.92716			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-4480.51	5392.923	-0.83	0.4276
MART	1	-44.5803	34.58619	-1.29	0.2296
MART2	1	0.422893	0.288502	1.47	0.1767
APRT	1	-10.5327	20.37985	-0.52	0.6177
APRT2	1	0.104518	0.154284	0.68	0.5152
MAYT	1	17.12509	37.48219	0.46	0.6586
MAYT2	1	-0.12319	0.258519	-0.48	0.6450
JUNT	1	35.03847	45.87833	0.76	0.4646
JUNT2	1	-0.22554	0.277423	-0.81	0.4372
JULT	1	75.41521	107.5656	0.70	0.5010
JULT2	1	-0.40976	0.590842	-0.69	0.5055
AUGT	1	-8.79602	85.59072	-0.10	0.9204
AUGT2	1	0.055845	0.481993	0.12	0.9103
SEPT	1	24.13202	61.41148	0.39	0.7035
SEPT2	1	-0.16638	0.368108	-0.45	0.6620
MARP	1	12.24216	7.089832	1.73	0.1183
MARP2	1	-0.40236	0.401526	-1.00	0.3425
APRP	1	-1.40261	18.84040	-0.07	0.9423
APRP2	1	-0.20307	2.529545	-0.08	0.9378
MAYP	1	-19.7897	23.74140	-0.83	0.4261
MAYP2	1	2.321788	4.047907	0.57	0.5803
JUNP	1	-8.61955	36.09967	-0.24	0.8166
JUNP2	1	-1.29534	19.47096	-0.07	0.9484
JULP	1	-0.26739	33.26312	-0.01	0.9938

App. IX: Attachment

JULP2	1	-5.47111	12.09689	-0.45	0.6618
AUGP	1	-60.6047	76.29333	-0.79	0.4474
AUGP2	1	41.06867	44.38476	0.93	0.3790
SEPP	1	-14.7432	22.19977	-0.66	0.5233
SEPP2	1	-1.87904	3.751640	-0.50	0.6285
GOOD LAND	1	-104.802	219.0142	-0.48	0.6437
MED LAND	1	-101.719	307.9267	-0.33	0.7487
T	1	1.688061	0.965652	1.75	0.1144

NORTH EAST REGION AND MOUNTAIN AREA, Barley

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	163455.1	5272.745	18.99	<.0001
Error	373	103546.3	277.6039		
Corrected Total	404	267001.3			
Root MSE		16.66145	R-Square	0.61219	
Dependent Mean		48.16346	Adj R-Sq	0.57996	
Coeff Var		34.59355			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	1205.776	301.0942	4.00	<.0001
MART	1	-2.60699	2.501491	-1.04	0.2980
MART2	1	0.024972	0.022813	1.09	0.2744
APRT	1	1.082859	1.955143	0.55	0.5800
APRT2	1	-0.01124	0.015995	-0.70	0.4827
MAYT	1	-1.52508	2.638619	-0.58	0.5636
MAYT2	1	0.009496	0.018995	0.50	0.6174
JUNT	1	-9.69907	4.078405	-2.38	0.0179
JUNT2	1	0.052433	0.025230	2.08	0.0384
JULT	1	-14.9691	6.849510	-2.19	0.0295
JULT2	1	0.086536	0.038876	2.23	0.0266
AUGT	1	1.346292	5.498986	0.24	0.8067
AUGT2	1	-0.00634	0.031245	-0.20	0.8394
SEPT	1	-5.13928	3.595272	-1.43	0.1537
SEPT2	1	0.031073	0.022633	1.37	0.1706
MARP	1	-0.64267	0.882085	-0.73	0.4667
MARP2	1	0.036715	0.051486	0.71	0.4762
APRP	1	-2.07490	1.406330	-1.48	0.1409
APRP2	1	0.155690	0.119855	1.30	0.1948
MAYP	1	1.158234	2.166495	0.53	0.5932
MAYP2	1	-0.12026	0.360730	-0.33	0.7390
JUNP	1	-7.32964	2.757821	-2.66	0.0082
JUNP2	1	1.846773	0.761174	2.43	0.0157
JULP	1	-3.17074	5.221471	-0.61	0.5441

App. IX: Attachment

JULP2	1	0.710217	2.992457	0.24	0.8125
AUGP	1	1.861342	3.367914	0.55	0.5808
AUGP2	1	-0.56951	0.670536	-0.85	0.3962
SEPP	1	0.700372	2.483474	0.28	0.7781
SEPP2	1	-0.24350	0.366797	-0.66	0.5072
GOOD LAND	1	162.1957	16.50521	9.83	<.0001
MED LAND	1	132.9742	23.86300	5.57	<.0001
T	1	0.860517	0.077492	11.10	<.0001

NORTH EAST REGION AND MOUNTAIN AREA, OATS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	80380.00	2592.903	6.02	<.0001
Error	111	47819.98	430.8106		
Corrected Total	142	128200.0			
Root MSE		20.75598	R-Square	0.62699	
Dependent Mean		69.14825	Adj R-Sq	0.52281	
Coeff Var		30.01663			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	715.4934	875.5723	0.82	0.4156
MART	1	6.601022	6.646180	0.99	0.3228
MART2	1	-0.06390	0.059736	-1.07	0.2870
APRT	1	5.574101	5.924321	0.94	0.3488
APRT2	1	-0.04788	0.048189	-0.99	0.3226
MAYT	1	-13.3540	6.676155	-2.00	0.0479
MAYT2	1	0.100395	0.048826	2.06	0.0421
JUNT	1	-0.40106	12.47189	-0.03	0.9744
JUNT2	1	-0.00139	0.078603	-0.02	0.9859
JULT	1	-28.0426	16.43135	-1.71	0.0907
JULT2	1	0.162140	0.094226	1.72	0.0881
AUGT	1	0.309143	16.96317	0.02	0.9855
AUGT2	1	-0.00246	0.098619	-0.02	0.9802
SEPT	1	13.07740	10.45524	1.25	0.2136
SEPT2	1	-0.08709	0.067625	-1.29	0.2005
MARP	1	-1.00346	1.936299	-0.52	0.6053
MARP2	1	0.058639	0.103290	0.57	0.5714
APRP	1	1.820257	5.092438	0.36	0.7214
APRP2	1	-0.47451	0.759267	-0.62	0.5333
MAYP	1	3.350653	5.486729	0.61	0.5427
MAYP2	1	-0.31170	0.873781	-0.36	0.7220
JUNP	1	12.07593	8.780967	1.38	0.1718
JUNP2	1	-3.81569	3.536743	-1.08	0.2830
JULP	1	-0.41048	11.01137	-0.04	0.9703

App. IX: Attachment

JULP2	1	-0.80818	4.874944	-0.17	0.8686
AUGP	1	-7.75062	8.017834	-0.97	0.3358
AUGP2	1	0.888653	1.614005	0.55	0.5830
SEPP	1	-7.27060	5.386383	-1.35	0.1798
SEPP2	1	1.233405	0.907190	1.36	0.1767
GOOD LAND	1	240.6770	34.40876	6.99	<.0001
MED LAND	1	168.7602	53.80995	3.14	0.0022
T	1	0.594020	0.330228	1.80	0.0748

NORTH EAST REGION AND MOUNTAIN AREA, WINTER WHEAT

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	106454.2	2729.595	14.55	<.0001
Error	384	72026.36	187.5686		
Corrected Total	423	178480.6			
Root MSE		13.69557	R-Square	0.59645	
Dependent Mean		37.84222	Adj R-Sq	0.55546	
Coeff Var		36.19125			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	149.6445	134.9201	1.11	0.2681
OCTT	1	0.825418	1.777006	0.46	0.6426
OCTT2	1	-0.00559	0.013100	-0.43	0.6697
NOVT	1	-1.09480	1.525119	-0.72	0.4733
NOVT2	1	0.008638	0.013814	0.63	0.5321
DECT	1	1.983809	1.362302	1.46	0.1461
DECT2	1	-0.02184	0.014352	-1.52	0.1288
JANT	1	0.136843	1.440846	0.09	0.9244
JANT2	1	-0.00096	0.015768	-0.06	0.9517
FEBT	1	-0.95655	1.448190	-0.66	0.5093
FEBT2	1	0.010593	0.014303	0.74	0.4594
MART	1	3.143908	2.225846	1.41	0.1586
MART2	1	-0.03263	0.020240	-1.61	0.1077
APRT	1	0.618034	1.712141	0.36	0.7183
APRT2	1	-0.00090	0.013815	-0.07	0.9481
MAYT	1	-3.84061	2.020604	-1.90	0.0581
MAYT2	1	0.023676	0.014167	1.67	0.0955
JUNT	1	-5.24542	2.908557	-1.80	0.0721
JUNT2	1	0.031722	0.017820	1.78	0.0758
OCTP	1	1.678162	1.064051	1.58	0.1156
OCTP2	1	-0.07060	0.118146	-0.60	0.5505
NOVP	1	0.023807	0.710373	0.03	0.9733
NOVP2	1	-0.03045	0.047310	-0.64	0.5202
DECP	1	-0.99755	0.501202	-1.99	0.0473

App. IX: Attachment

DECP2	1	0.034751	0.020266	1.71	0.0872
JANP	1	0.965880	0.603212	1.60	0.1101
JANP2	1	-0.01904	0.027891	-0.68	0.4953
FEBP	1	0.995224	0.714844	1.39	0.1647
FEBP2	1	-0.04909	0.043918	-1.12	0.2644
MARP	1	-2.16332	0.836281	-2.59	0.0101
MARP2	1	0.095949	0.049261	1.95	0.0522
APRP	1	1.896176	1.360488	1.39	0.1642
APRP2	1	-0.14515	0.139848	-1.04	0.3000
MAYP	1	-0.63840	1.659426	-0.38	0.7007
MAYP2	1	0.026005	0.279929	0.09	0.9260
JUNP	1	-0.91469	2.338665	-0.39	0.6959
JUNP2	1	0.264025	0.626692	0.42	0.6738
GOOD LAND	1	88.65770	15.94185	5.56	<.0001
MED LAND	1	66.24244	22.69746	2.92	0.0037
T	1	0.827847	0.056893	14.55	<.0001

COAST REGION, CORN FOR GRAIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	31060.25	1001.944	0.77	0.7837
Error	68	88182.60	1296.803		
Corrected Total	99	119242.9			
Root MSE		36.01115	R-Square	0.26048	
Dependent Mean		72.57300	Adj R-Sq	-0.07666	
Coeff Var		49.62059			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	476.0320	1782.558	0.27	0.7902
MART	1	-2.94360	29.42221	-0.10	0.9206
MART2	1	0.032042	0.217847	0.15	0.8835
APRT	1	4.231467	24.23062	0.17	0.8619
APRT2	1	-0.02139	0.169719	-0.13	0.9001
MAYT	1	38.55664	28.36055	1.36	0.1785
MAYT2	1	-0.23602	0.185284	-1.27	0.2071
JUNT	1	-0.28469	20.68522	-0.01	0.9891
JUNT2	1	-0.00187	0.126710	-0.01	0.9883
JULT	1	-31.4867	23.12586	-1.36	0.1778
JULT2	1	0.178869	0.131808	1.36	0.1793
AUGT	1	4.456553	24.61583	0.18	0.8569
AUGT2	1	-0.02286	0.140604	-0.16	0.8713
SEPT	1	-21.2660	32.20232	-0.66	0.5112
SEPT2	1	0.120746	0.188548	0.64	0.5241
MARP	1	1.209854	5.773891	0.21	0.8347
MARP2	1	0.229696	0.483594	0.47	0.6363
APRP	1	-4.67518	8.511082	-0.55	0.5846
APRP2	1	0.845612	1.519419	0.56	0.5797
MAYP	1	19.90264	17.16402	1.16	0.2503
MAYP2	1	-2.66465	5.041052	-0.53	0.5988
JUNP	1	37.21637	39.84628	0.93	0.3536
JUNP2	1	-12.0013	26.29017	-0.46	0.6495
JULP	1	79.34647	155.9424	0.51	0.6125

App. IX: Attachment

JULP2	1	-143.510	275.5273	-0.52	0.6042
AUGP	1	95.72755	69.42505	1.38	0.1725
AUGP2	1	-57.6350	46.39917	-1.24	0.2184
SEPP	1	3.119188	15.90808	0.20	0.8451
SEPP2	1	-1.36834	5.199749	-0.26	0.7932
GOOD LAND	1	17.09339	77.09660	0.22	0.8252
MED LAND	1	145.1322	179.5731	0.81	0.4218
T	1	-0.32742	0.426126	-0.77	0.4449

COAST REGION, CORN FOR SILLAGE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	856.6165	27.63279	2.53	0.0022
Error	45	491.8016	10.92893		
Corrected Total	76	1348.418			
Root MSE		3.30589	R-Square	0.63528	
Dependent Mean		21.66364	Adj R-Sq	0.38402	
Coeff Var		15.26010			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-412.116	251.3602	-1.64	0.1081
MART	1	7.643391	5.496703	1.39	0.1712
MART2	1	-0.05757	0.040690	-1.41	0.1640
APRT	1	-1.19305	4.214424	-0.28	0.7784
APRT2	1	0.009501	0.028511	0.33	0.7405
MAYT	1	0.577317	2.228259	0.26	0.7967
MAYT2	1	-0.00330	0.014211	-0.23	0.8172
JUNT	1	0.803249	1.859870	0.43	0.6679
JUNT2	1	-0.00354	0.011036	-0.32	0.7498
JULT	1	2.986737	2.587938	1.15	0.2546
JULT2	1	-0.02051	0.014735	-1.39	0.1708
AUGT	1	3.474157	3.129253	1.11	0.2728
AUGT2	1	-0.02011	0.017534	-1.15	0.2576
SEPT	1	-1.86231	2.489984	-0.75	0.4584
SEPT2	1	0.011201	0.014665	0.76	0.4490
MARP	1	-0.61425	0.564315	-1.09	0.2822
MARP2	1	0.055197	0.044969	1.23	0.2260
APRP	1	2.056447	1.643684	1.25	0.2174
APRP2	1	-0.26353	0.415084	-0.63	0.5287
MAYP	1	1.007038	1.986675	0.51	0.6147
MAYP2	1	-0.38894	0.523883	-0.74	0.4617
JUNP	1	6.480164	7.883064	0.82	0.4154
JUNP2	1	-6.17251	8.573795	-0.72	0.4753
JULP	1	6.752108	10.09691	0.67	0.5071

App. IX: Attachment

JULP2	1	-17.7711	9.828972	-1.81	0.0773
AUGP	1	-8.27388	7.704290	-1.07	0.2886
AUGP2	1	2.021465	6.871997	0.29	0.7700
SEPP	1	-4.05536	1.800924	-2.25	0.0293
SEPP2	1	1.067030	0.596825	1.79	0.0805
GOOD LAND	1	-17.9191	12.15957	-1.47	0.1475
MED LAND	1	-53.3851	20.46133	-2.61	0.0123
T	1	-0.08896	0.083656	-1.06	0.2933

COAST REGION, Barley

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	32963.71	1063.345	6.91	<.0001
Error	651	100235.7	153.9719		
Corrected Total	682	133199.4			
Root MSE		12.40854	R-Square	0.24748	
Dependent Mean		37.66164	Adj R-Sq	0.21164	
Coeff Var		32.94743			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	385.5590	182.2835	2.12	0.0348
MART	1	2.019804	2.986740	0.68	0.4991
MART2	1	-0.01523	0.021991	-0.69	0.4889
APRT	1	2.770901	2.816797	0.98	0.3256
APRT2	1	-0.02310	0.019598	-1.18	0.2389
MAYT	1	-2.40734	3.014898	-0.80	0.4249
MAYT2	1	0.016882	0.019455	0.87	0.3858
JUNT	1	-2.64920	2.324445	-1.14	0.2548
JUNT2	1	0.016774	0.014051	1.19	0.2330
JULT	1	-7.85950	2.648690	-2.97	0.0031
JULT2	1	0.043198	0.015189	2.84	0.0046
AUGT	1	3.825341	3.181479	1.20	0.2297
AUGT2	1	-0.01689	0.018012	-0.94	0.3488
SEPT	1	-4.05337	3.139830	-1.29	0.1972
SEPT2	1	0.022978	0.018315	1.25	0.2101
MARP	1	0.686024	0.511947	1.34	0.1807
MARP2	1	-0.04423	0.038929	-1.14	0.2564
APRP	1	-1.23372	1.076980	-1.15	0.2524
APRP2	1	0.157235	0.189841	0.83	0.4078
MAYP	1	-2.36326	2.328927	-1.01	0.3106
MAYP2	1	0.759488	0.756469	1.00	0.3158
JUNP	1	1.571546	4.688949	0.34	0.7376
JUNP2	1	-3.65723	3.236943	-1.13	0.2590
JULP	1	-2.66622	11.20305	-0.24	0.8120

App. IX: Attachment

JULP2	1	0.940512	14.21664	0.07	0.9473
AUGP	1	-9.18557	4.946416	-1.86	0.0638
AUGP2	1	6.331915	3.031381	2.09	0.0371
SEPP	1	1.158641	1.893262	0.61	0.5408
SEPP2	1	-0.45390	0.628945	-0.72	0.4707
GOOD LAND	1	-5.81578	7.171720	-0.81	0.4177
MED LAND	1	1.985359	16.65861	0.12	0.9052
T	1	0.325264	0.041680	7.80	<.0001

COAST REGION, COTTON

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	2504118	80778.01	1.22	0.3371
Error	17	1122587	66034.55		
Corrected Total	48	3626706			
Root MSE		256.97188	R-Square	0.69047	
Dependent Mean		645.38776	Adj R-Sq	0.12602	
Coeff Var		39.81666			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	127885.4	94642.63	1.35	0.1943
MART	1	-357.516	398.1088	-0.90	0.3817
MART2	1	2.500711	2.834771	0.88	0.3900
APRT	1	-240.155	418.8665	-0.57	0.5739
APRT2	1	1.697146	2.842776	0.60	0.5584
MAYT	1	158.8902	609.7776	0.26	0.7976
MAYT2	1	-1.11879	3.830057	-0.29	0.7737
JUNT	1	-269.367	485.2293	-0.56	0.5860
JUNT2	1	1.555741	2.882562	0.54	0.5964
JULT	1	-1296.71	1526.930	-0.85	0.4076
JULT2	1	6.989624	8.150521	0.86	0.4031
AUGT	1	-287.420	1186.000	-0.24	0.8114
AUGT2	1	1.443745	6.460672	0.22	0.8258
SEPT	1	-159.178	877.4721	-0.18	0.8582
SEPT2	1	0.931353	4.901454	0.19	0.8515
MARP	1	-21.9792	92.40429	-0.24	0.8148
MARP2	1	1.840825	8.150855	0.23	0.8240
APRP	1	119.9192	127.4370	0.94	0.3599
APRP2	1	-24.4939	21.44883	-1.14	0.2693
MAYP	1	-215.757	513.7381	-0.42	0.6798
MAYP2	1	106.4180	300.0282	0.35	0.7272
JUNP	1	1852.820	2193.362	0.84	0.4100
JUNP2	1	-4063.52	7019.504	-0.58	0.5703
JULP	1	-624.484	2526.318	-0.25	0.8077

App. IX: Attachment

JULP2	1	2127.353	3915.832	0.54	0.5940
AUGP	1	2756.843	2336.929	1.18	0.2544
AUGP2	1	2080.159	8500.032	0.24	0.8096
SEPP	1	109.5700	852.3345	0.13	0.8992
SEPP2	1	-669.560	1135.777	-0.59	0.5633
GOOD LAND	1	-29056.3	21093.98	-1.38	0.1862
MED LAND	1	-61365.2	44961.59	-1.36	0.1901
T	1	20.40885	6.363352	3.21	0.0052

COAST REGION, DRY BEANS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	8781647	283278.9	133.73	<.0001
Error	40	84731.29	2118.282		
Corrected Total	71	8866378			
Root MSE		46.02480	R-Square	0.99044	
Dependent Mean		1438.72222	Adj R-Sq	0.98304	
Coeff Var		3.19901			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	30640.10	7555.386	4.06	0.0002
MART	1	-985.497	104.4412	-9.44	<.0001
MART2	1	6.870155	0.759093	9.05	<.0001
APRT	1	653.8758	133.4023	4.90	<.0001
APRT2	1	-4.44429	0.897866	-4.95	<.0001
MAYT	1	361.7735	173.2801	2.09	0.0432
MAYT2	1	-2.60508	1.182055	-2.20	0.0334
JUNT	1	-889.663	173.1253	-5.14	<.0001
JUNT2	1	6.037515	1.098989	5.49	<.0001
JULT	1	-523.962	245.7678	-2.13	0.0392
JULT2	1	3.031768	1.521125	1.99	0.0531
AUGT	1	610.2160	132.7037	4.60	<.0001
AUGT2	1	-3.19782	0.772895	-4.14	0.0002
SEPT	1	-43.2018	89.11359	-0.48	0.6305
SEPT2	1	0.066186	0.544422	0.12	0.9038
MARP	1	30.23935	11.42161	2.65	0.0115
MARP2	1	-0.81339	0.667884	-1.22	0.2304
APRP	1	-260.097	54.36502	-4.78	<.0001
APRP2	1	77.19782	13.46376	5.73	<.0001
MAYP	1	114.0677	57.69124	1.98	0.0549
MAYP2	1	-57.1103	23.77455	-2.40	0.0210
JUNP	1	-157.311	103.4474	-1.52	0.1362
JUNP2	1	263.1553	90.64787	2.90	0.0060
JULP	1	274.3893	554.0464	0.50	0.6231

App. IX: Attachment

JULP2	1	-2544.16	1251.582	-2.03	0.0488
AUGP	1	1706.585	1075.773	1.59	0.1205
AUGP2	1	-16021.7	6660.008	-2.41	0.0209
SEPP	1	-380.610	116.1669	-3.28	0.0022
SEPP2	1	209.2896	48.84443	4.28	0.0001
GOOD LAND	1	1273.447	219.8335	5.79	<.0001
MED LAND	1	-68.9935	803.1986	-0.09	0.9320
T	1	-14.8482	5.867671	-2.53	0.0154

COAST REGION, OATS

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	10663.42	343.9812	1.35	0.1224
Error	149	38006.73	255.0787		
Corrected Total	180	48670.14			
Root MSE		15.97118	R-Square	0.21910	
Dependent Mean		51.31602	Adj R-Sq	0.05663	
Coeff Var		31.12319			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	761.6827	532.9500	1.43	0.1550
MART	1	-8.31445	8.873459	-0.94	0.3503
MART2	1	0.055336	0.066429	0.83	0.4062
APRT	1	6.832623	9.366954	0.73	0.4669
APRT2	1	-0.04956	0.064065	-0.77	0.4404
MAYT	1	1.658903	6.825957	0.24	0.8083
MAYT2	1	-0.00973	0.044583	-0.22	0.8276
JUNT	1	-2.96822	6.119096	-0.49	0.6283
JUNT2	1	0.012917	0.037072	0.35	0.7280
JULT	1	-4.80103	7.424144	-0.65	0.5188
JULT2	1	0.026297	0.042380	0.62	0.5359
AUGT	1	0.381359	9.561330	0.04	0.9682
AUGT2	1	0.006233	0.053665	0.12	0.9077
SEPT	1	-10.6273	9.073469	-1.17	0.2434
SEPT2	1	0.065112	0.053207	1.22	0.2230
MARP	1	-2.01095	1.479923	-1.36	0.1763
MARP2	1	0.086041	0.099846	0.86	0.3902
APRP	1	-0.28208	4.273675	-0.07	0.9475
APRP2	1	-0.07275	1.057267	-0.07	0.9452
MAYP	1	-1.39298	5.139095	-0.27	0.7867
MAYP2	1	-0.12741	1.457135	-0.09	0.9304
JUNP	1	9.543135	18.19489	0.52	0.6007
JUNP2	1	-0.36553	19.40835	-0.02	0.9850
JULP	1	44.60126	32.34756	1.38	0.1700

App. IX: Attachment

JULP2	1	-46.6793	32.15272	-1.45	0.1487
AUGP	1	-1.83094	23.43793	-0.08	0.9378
AUGP2	1	-1.35445	22.72178	-0.06	0.9525
SEPP	1	14.73370	5.227448	2.82	0.0055
SEPP2	1	-4.01411	1.962600	-2.05	0.0426
GOOD LAND	1	14.73625	26.06250	0.57	0.5726
MED LAND	1	94.83894	48.03812	1.97	0.0502
T	1	-0.05726	0.223911	-0.26	0.7985

COAST REGION, WINTER WHEAT

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	106558.0	2732.255	15.61	<.0001
Error	562	98361.62	175.0207		
Corrected Total	601	204919.6			
Root MSE		13.22954	R-Square	0.52000	
Dependent Mean		33.58140	Adj R-Sq	0.48669	
Coeff Var		39.39544			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	529.1546	291.0525	1.82	0.0696
OCTT	1	-7.97702	4.337003	-1.84	0.0664
OCTT2	1	0.051610	0.027322	1.89	0.0594
NOVT	1	1.050022	3.235207	0.32	0.7456
NOVT2	1	-0.00923	0.023095	-0.40	0.6897
DECT	1	-0.90002	2.384014	-0.38	0.7059
DECT2	1	0.002373	0.018883	0.13	0.9000
JANT	1	0.681463	2.695279	0.25	0.8005
JANT2	1	-0.00428	0.021371	-0.20	0.8414
FEBT	1	0.068382	3.255229	0.02	0.9832
FEBT2	1	-0.00342	0.024641	-0.14	0.8896
MART	1	-1.93714	4.500861	-0.43	0.6671
MART2	1	0.012064	0.033249	0.36	0.7169
APRT	1	-4.76054	3.330564	-1.43	0.1535
APRT2	1	0.038377	0.023375	1.64	0.1012
MAYT	1	-3.89871	3.326620	-1.17	0.2417
MAYT2	1	0.028618	0.021460	1.33	0.1829
JUNT	1	3.380970	2.585993	1.31	0.1916
JUNT2	1	-0.02158	0.015637	-1.38	0.1681
OCTP	1	1.903446	1.115236	1.71	0.0884
OCTP2	1	-0.25087	0.141222	-1.78	0.0762
NOVP	1	-1.11845	0.778042	-1.44	0.1511
NOVP2	1	0.079019	0.076783	1.03	0.3039

App. IX: Attachment

DECP	1	-1.97695	0.515531	-3.83	0.0001
DECP2	1	0.118335	0.032616	3.63	0.0003
JANP	1	0.122139	0.413772	0.30	0.7680
JANP2	1	-0.00848	0.020499	-0.41	0.6793
FEBP	1	-0.53029	0.460787	-1.15	0.2503
FEBP2	1	-0.00574	0.028552	-0.20	0.8407
MARP	1	0.482196	0.704404	0.68	0.4939
MARP2	1	-0.04267	0.048923	-0.87	0.3834
APRP	1	-1.40123	1.233889	-1.14	0.2566
APRP2	1	0.162197	0.202160	0.80	0.4227
MAYP	1	2.972197	2.447324	1.21	0.2251
MAYP2	1	-0.42559	0.718804	-0.59	0.5540
JUNP	1	7.824156	5.205232	1.50	0.1334
JUNP2	1	-5.68780	3.518634	-1.62	0.1066
GOOD LAND	1	-23.1104	10.01905	-2.31	0.0214
MED LAND	1	-35.7553	20.18076	-1.77	0.0770
T	1	0.692889	0.046742	14.82	<.0001

The Following Yield Response Functions Are Estimated Using Data From All Counties in California

Orange Valencia

The SYSLIN Procedure
Ordinary Least Squares Estimation
Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	954.3424	30.78524	1.97	0.0168
Error	48	749.2645	15.60968		
Corrected Total	79	1703.607			
Root MSE		3.95091	R-Square	0.56019	
Dependent Mean		12.94800	Adj R-Sq	0.27614	
Coeff Var		30.51366			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	40.06659	124.1502	0.32	0.7483
MART	1	6.871702	2.926592	2.35	0.0230
MART2	1	-0.04615	0.020233	-2.28	0.0270
APRT	1	-2.98542	3.582548	-0.83	0.4088
APRT2	1	0.020922	0.022558	0.93	0.3583
MAYT	1	-2.37687	2.959810	-0.80	0.4259
MAYT2	1	0.013685	0.017694	0.77	0.4431
JUNT	1	-2.07303	2.439147	-0.85	0.3996
JUNT2	1	0.010893	0.013737	0.79	0.4317
JULT	1	4.358536	2.482364	1.76	0.0855
JULT2	1	-0.02240	0.013323	-1.68	0.0991
AUGT	1	-1.50499	2.856036	-0.53	0.6007
AUGT2	1	0.006604	0.015417	0.43	0.6703
SEPT	1	-2.58220	2.497776	-1.03	0.3064
SEPT2	1	0.012727	0.013878	0.92	0.3637
MARP	1	0.970280	0.647685	1.50	0.1407
MARP2	1	-0.08898	0.043746	-2.03	0.0475
APRP	1	-2.13157	2.715687	-0.78	0.4364
APRP2	1	1.274849	1.023464	1.25	0.2189
MAYP	1	3.937010	3.598353	1.09	0.2794
MAYP2	1	-1.88147	1.397773	-1.35	0.1846
JUNP	1	7.828232	4.473613	1.75	0.0865
JUNP2	1	-4.76807	2.781200	-1.71	0.0929
JULP	1	8.977216	16.96409	0.53	0.5991

App. IX: Attachment

JULP2	1	-20.5438	27.76313	-0.74	0.4629
AUGP	1	-1.88301	17.08907	-0.11	0.9127
AUGP2	1	3.322696	12.30851	0.27	0.7884
SEPP	1	-3.87954	3.835911	-1.01	0.3169
SEPP2	1	1.531264	2.023351	0.76	0.4529
goodlld	1	5.982985	4.825301	1.24	0.2210
medlld	1	-12.2799	20.29529	-0.61	0.5480
T	1	0.238783	0.137807	1.73	0.0896

HAY ALFALFA

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model		YIELD			
Dependent Variable		YIELD			
Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	394.3012	12.71939	20.02	<.0001
Error	346	219.7781	0.635197		
Corrected Total	377	614.0793			
Root MSE		0.79699	R-Square	0.64210	
Dependent Mean		6.73146	Adj R-Sq	0.61004	
Coeff Var		11.83982			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-2.42049	8.627447	-0.28	0.7792
MART	1	0.258539	0.138744	1.86	0.0632
MART2	1	-0.00132	0.001056	-1.25	0.2127
APRT	1	0.155808	0.149113	1.04	0.2968
APRT2	1	-0.00065	0.000999	-0.65	0.5180
MAYT	1	-0.07049	0.175200	-0.40	0.6877
MAYT2	1	0.000391	0.001083	0.36	0.7181
JUNT	1	0.054162	0.191172	0.28	0.7771
JUNT2	1	-0.00050	0.001097	-0.46	0.6478
JULT	1	-0.55324	0.253456	-2.18	0.0297
JULT2	1	0.003205	0.001384	2.31	0.0212
AUGT	1	0.064165	0.310554	0.21	0.8364
AUGT2	1	-0.00044	0.001680	-0.26	0.7954
SEPT	1	0.256148	0.190103	1.35	0.1787
SEPT2	1	-0.00151	0.001096	-1.38	0.1692
MARP	1	0.090952	0.052460	1.73	0.0839
MARP2	1	-0.00326	0.004239	-0.77	0.4430
APRP	1	-0.07101	0.146058	-0.49	0.6271
APRP2	1	0.007061	0.037838	0.19	0.8521
MAYP	1	-0.45156	0.157500	-2.87	0.0044
MAYP2	1	0.051775	0.044938	1.15	0.2501
JUNP	1	-0.58901	0.317571	-1.85	0.0645
JUNP2	1	0.305111	0.193344	1.58	0.1155
JULP	1	-1.43627	0.593581	-2.42	0.0160
JULP2	1	0.718632	0.512361	1.40	0.1616

App. IX: Attachment

AUGP	1	-0.33880	0.579037	-0.59	0.5589
AUGP2	1	0.351233	0.470896	0.75	0.4562
SEPP	1	-0.04239	0.214832	-0.20	0.8437
SEPP2	1	-0.05952	0.086825	-0.69	0.4935
goodld	1	3.174527	0.454940	6.98	<.0001
medld	1	2.442010	0.537385	4.54	<.0001
T	1	0.010106	0.009185	1.10	0.2720

GRAPES TABLE or GRAPES RAISIN

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	457.9087	14.77125	1.50	0.0539
Error	174	1709.478	9.824586		
Corrected Total	205	2167.387			
Root MSE		3.13442	R-Square	0.21127	
Dependent Mean		8.37850	Adj R-Sq	0.07075	
Coeff Var		37.41029			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-249.210	174.1089	-1.43	0.1541
MART	1	-0.89980	1.973667	-0.46	0.6490
MART2	1	0.005528	0.014131	0.39	0.6961
APRT	1	-0.77119	2.117823	-0.36	0.7162
APRT2	1	0.003689	0.013620	0.27	0.7868
MAYT	1	2.191416	2.308853	0.95	0.3439
MAYT2	1	-0.01308	0.013770	-0.95	0.3434
JUNT	1	-1.23698	2.761212	-0.45	0.6547
JUNT2	1	0.007035	0.014869	0.47	0.6367
JULT	1	4.145354	3.818239	1.09	0.2791
JULT2	1	-0.02159	0.019762	-1.09	0.2762
AUGT	1	2.268358	4.166198	0.54	0.5868
AUGT2	1	-0.01118	0.021612	-0.52	0.6055
SEPT	1	-0.62623	2.487868	-0.25	0.8016
SEPT2	1	0.003326	0.013906	0.24	0.8113
MARP	1	-0.78078	0.636317	-1.23	0.2215
MARP2	1	0.065438	0.095093	0.69	0.4923
APRP	1	-1.28844	1.361677	-0.95	0.3454
APRP2	1	0.340115	0.519887	0.65	0.5138
MAYP	1	0.492749	1.254630	0.39	0.6950
MAYP2	1	-0.48081	0.366538	-1.31	0.1913
JUNP	1	0.965331	2.066332	0.47	0.6410
JUNP2	1	-0.60031	1.211959	-0.50	0.6210
JULP	1	13.95305	13.76708	1.01	0.3122

App. IX: Attachment

JULP2	1	-23.7031	30.50821	-0.78	0.4382
AUGP	1	-10.7882	9.474694	-1.14	0.2564
AUGP2	1	6.696042	7.347675	0.91	0.3634
SEPP	1	-0.82748	1.825943	-0.45	0.6510
SEPP2	1	0.695964	0.934188	0.74	0.4573
goodld	1	-1.96642	2.541035	-0.77	0.4401
medld	1	-3.04126	3.345795	-0.91	0.3646
T	1	0.142389	0.059180	2.41	0.0172

GRAPES WINE

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	1585.070	51.13130	14.54	<.0001
Error	298	1047.989	3.516742		
Corrected Total	329	2633.060			
Root MSE		1.87530	R-Square	0.60199	
Dependent Mean		5.87715	Adj R-Sq	0.56058	
Coeff Var		31.90828			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-19.5304	18.43710	-1.06	0.2903
MART	1	1.271095	0.332183	3.83	0.0002
MART2	1	-0.01014	0.002518	-4.03	<.0001
APRT	1	0.066137	0.396287	0.17	0.8676
APRT2	1	-0.00052	0.002652	-0.20	0.8435
MAYT	1	-1.07218	0.425220	-2.52	0.0122
MAYT2	1	0.007463	0.002662	2.80	0.0054
JUNT	1	0.746165	0.538125	1.39	0.1666
JUNT2	1	-0.00461	0.003078	-1.50	0.1356
JULT	1	-1.24707	0.613635	-2.03	0.0430
JULT2	1	0.007829	0.003369	2.32	0.0208
AUGT	1	-0.69002	0.725625	-0.95	0.3424
AUGT2	1	0.003827	0.003955	0.97	0.3340
SEPT	1	1.385678	0.529738	2.62	0.0094
SEPT2	1	-0.00823	0.003061	-2.69	0.0075
MARP	1	-0.11015	0.095540	-1.15	0.2499
MARP2	1	0.007103	0.004872	1.46	0.1459
APRP	1	-0.57711	0.214633	-2.69	0.0076
APRP2	1	0.069681	0.028828	2.42	0.0162
MAYP	1	-0.07604	0.275690	-0.28	0.7829
MAYP2	1	-0.03070	0.043475	-0.71	0.4806
JUNP	1	0.139175	0.588005	0.24	0.8131
JUNP2	1	-0.10245	0.249399	-0.41	0.6815
JULP	1	0.352315	1.901867	0.19	0.8532

App. IX: Attachment

JULP2	1	-0.36305	0.850636	-0.43	0.6698
AUGP	1	-0.97073	1.931826	-0.50	0.6157
AUGP2	1	0.705577	1.787641	0.39	0.6933
SEPP	1	0.283191	0.428466	0.66	0.5092
SEPP2	1	-0.14541	0.131114	-1.11	0.2683
goodld	1	4.712628	1.061868	4.44	<.0001
medld	1	11.14256	1.211007	9.20	<.0001
T	1	0.100167	0.023599	4.24	<.0001

TOMATOES FRESH MARKET

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	5072.052	163.6146	5.25	<.0001
Error	174	5417.730	31.13638		
Corrected Total	205	10489.78			
Root MSE		5.58000	R-Square	0.48352	
Dependent Mean		16.31277	Adj R-Sq	0.39151	
Coeff Var		34.20632			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-428.526	118.4505	-3.62	0.0004
MART	1	-0.37413	2.078305	-0.18	0.8573
MART2	1	0.005333	0.014656	0.36	0.7164
APRT	1	4.802692	2.434854	1.97	0.0501
APRT2	1	-0.02886	0.015522	-1.86	0.0647
MAYT	1	0.571177	2.095149	0.27	0.7855
MAYT2	1	-0.00642	0.012620	-0.51	0.6118
JUNT	1	0.078721	1.823095	0.04	0.9656
JUNT2	1	-0.00041	0.010337	-0.04	0.9683
JULT	1	3.956385	2.528893	1.56	0.1195
JULT2	1	-0.02232	0.013547	-1.65	0.1012
AUGT	1	-0.81713	3.324792	-0.25	0.8062
AUGT2	1	0.002920	0.017679	0.17	0.8690
SEPT	1	2.617623	2.506086	1.04	0.2977
SEPT2	1	-0.01421	0.014054	-1.01	0.3132
MARP	1	0.338752	0.537516	0.63	0.5294
MARP2	1	-0.02549	0.040266	-0.63	0.5275
APRP	1	-3.16187	1.719044	-1.84	0.0676
APRP2	1	1.532215	0.530430	2.89	0.0044
MAYP	1	-2.36351	1.798695	-1.31	0.1906
MAYP2	1	0.063916	0.563074	0.11	0.9098
JUNP	1	-1.10595	3.711021	-0.30	0.7660
JUNP2	1	0.090188	2.566400	0.04	0.9720
JULP	1	-5.86004	14.07522	-0.42	0.6777

App. IX: Attachment

JULP2	1	12.18752	23.17933	0.53	0.5997
AUGP	1	-1.27446	7.256072	-0.18	0.8608
AUGP2	1	-3.14856	5.581702	-0.56	0.5734
SEPP	1	2.928295	2.686619	1.09	0.2772
SEPP2	1	-1.52275	1.223383	-1.24	0.2149
goodld	1	6.249191	3.762351	1.66	0.0985
medld	1	-13.3474	5.299355	-2.52	0.0127
T	1	-0.00215	0.091994	-0.02	0.9814

TOMATOES PROCESSING

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	3862.144	124.5853	13.29	<.0001
Error	213	1997.379	9.377367		
Corrected Total	244	5859.523			
Root MSE		3.06225	R-Square	0.65912	
Dependent Mean		32.00751	Adj R-Sq	0.60951	
Coeff Var		9.56728			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-18.6245	62.96677	-0.30	0.7677
MART	1	-0.30500	1.115252	-0.27	0.7848
MART2	1	0.001714	0.007975	0.21	0.8301
APRT	1	0.060532	1.363767	0.04	0.9646
APRT2	1	0.000194	0.008751	0.02	0.9823
MAYT	1	1.766194	1.336473	1.32	0.1877
MAYT2	1	-0.01091	0.008067	-1.35	0.1777
JUNT	1	2.384085	1.092431	2.18	0.0302
JUNT2	1	-0.01411	0.006143	-2.30	0.0226
JULT	1	-2.96185	1.774969	-1.67	0.0967
JULT2	1	0.015046	0.009475	1.59	0.1138
AUGT	1	0.260129	1.939428	0.13	0.8934
AUGT2	1	0.000595	0.010385	0.06	0.9544
SEPT	1	-1.14226	1.467953	-0.78	0.4374
SEPT2	1	0.006838	0.008292	0.82	0.4105
MARP	1	-0.22670	0.327766	-0.69	0.4899
MARP2	1	0.020329	0.030988	0.66	0.5125
APRP	1	0.082053	0.787075	0.10	0.9171
APRP2	1	-0.19557	0.202995	-0.96	0.3364
MAYP	1	0.101638	0.909698	0.11	0.9111
MAYP2	1	-0.32427	0.276753	-1.17	0.2426
JUNP	1	0.087413	1.776544	0.05	0.9608
JUNP2	1	-0.80346	1.171495	-0.69	0.4936
JULP	1	16.99834	7.724418	2.20	0.0288

App. IX: Attachment

JULP2	1	-18.6309	12.71111	-1.47	0.1442
AUGP	1	-2.80795	3.238895	-0.87	0.3869
AUGP2	1	2.217897	2.601193	0.85	0.3948
SEPP	1	2.620569	1.208059	2.17	0.0312
SEPP2	1	-1.10298	0.537575	-2.05	0.0414
goodld	1	-5.94687	1.903547	-3.12	0.0020
medld	1	-12.5299	2.604250	-4.81	<.0001
T	1	0.625274	0.047731	13.10	<.0001

ALMONDS ALL

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	11.20854	0.361566	9.18	<.0001
Error	207	8.156773	0.039405		
Corrected Total	238	19.36531			
Root MSE		0.19851	R-Square	0.57879	
Dependent Mean		0.56552	Adj R-Sq	0.51572	
Coeff Var		35.10134			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	4.446718	4.766856	0.93	0.3520
MART	1	-0.01118	0.061672	-0.18	0.8563
MART2	1	0.000088	0.000472	0.19	0.8525
APRT	1	-0.01955	0.069776	-0.28	0.7796
APRT2	1	0.000193	0.000468	0.41	0.6803
MAYT	1	-0.04812	0.065545	-0.73	0.4637
MAYT2	1	0.000361	0.000407	0.89	0.3763
JUNT	1	-0.07793	0.076805	-1.01	0.3115
JUNT2	1	0.000439	0.000437	1.01	0.3157
JULT	1	0.007075	0.106323	0.07	0.9470
JULT2	1	0.000033	0.000571	0.06	0.9534
AUGT	1	0.198266	0.137824	1.44	0.1518
AUGT2	1	-0.00109	0.000740	-1.48	0.1412
SEPT	1	-0.22863	0.096904	-2.36	0.0192
SEPT2	1	0.001414	0.000556	2.54	0.0118
MARP	1	-0.04713	0.016851	-2.80	0.0056
MARP2	1	0.002847	0.001332	2.14	0.0337
APRP	1	0.013623	0.032428	0.42	0.6748
APRP2	1	-0.00374	0.004855	-0.77	0.4415
MAYP	1	0.024687	0.050200	0.49	0.6234
MAYP2	1	-0.00514	0.013864	-0.37	0.7111
JUNP	1	-0.03310	0.072177	-0.46	0.6470
JUNP2	1	0.043996	0.030824	1.43	0.1550
JULP	1	-0.25169	0.207785	-1.21	0.2272

App. IX: Attachment

JULP2	1	0.147285	0.086582	1.70	0.0904
AUGP	1	-0.24271	0.199415	-1.22	0.2250
AUGP2	1	0.313042	0.169134	1.85	0.0656
SEPP	1	0.018787	0.068066	0.28	0.7828
SEPP2	1	-0.00510	0.024667	-0.21	0.8364
goodld	1	0.243675	0.158815	1.53	0.1265
medld	1	0.553472	0.179428	3.08	0.0023
T	1	0.009377	0.003017	3.11	0.0021

WALNUTS ENGLISH

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	44.08824	1.422201	7.76	<.0001
Error	362	66.35277	0.183295		
Corrected Total	393	110.4410			
Root MSE		0.42813	R-Square	0.39920	
Dependent Mean		1.06662	Adj R-Sq	0.34775	
Coeff Var		40.13874			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-3.59121	4.426051	-0.81	0.4177
MART	1	0.117035	0.074344	1.57	0.1163
MART2	1	-0.00099	0.000574	-1.72	0.0858
APRT	1	0.041697	0.086518	0.48	0.6301
APRT2	1	-0.00029	0.000585	-0.49	0.6237
MAYT	1	0.005500	0.096601	0.06	0.9546
MAYT2	1	-0.00003	0.000606	-0.05	0.9612
JUNT	1	0.062719	0.123633	0.51	0.6123
JUNT2	1	-0.00038	0.000706	-0.54	0.5918
JULT	1	-0.18415	0.145466	-1.27	0.2064
JULT2	1	0.001089	0.000796	1.37	0.1724
AUGT	1	-0.08109	0.176551	-0.46	0.6463
AUGT2	1	0.000532	0.000963	0.55	0.5809
SEPT	1	0.129406	0.109394	1.18	0.2376
SEPT2	1	-0.00074	0.000635	-1.17	0.2425
MARP	1	-0.05251	0.022123	-2.37	0.0181
MARP2	1	0.002532	0.001248	2.03	0.0432
APRP	1	-0.06410	0.045501	-1.41	0.1598
APRP2	1	0.005252	0.006450	0.81	0.4160
MAYP	1	-0.18409	0.061124	-3.01	0.0028
MAYP2	1	0.023374	0.011000	2.12	0.0343
JUNP	1	0.176906	0.118953	1.49	0.1378
JUNP2	1	-0.04111	0.055603	-0.74	0.4602
JULP	1	-0.23974	0.335480	-0.71	0.4753

App. IX: Attachment

JULP2	1	-0.00308	0.168178	-0.02	0.9854
AUGP	1	0.265923	0.365130	0.73	0.4669
AUGP2	1	-0.33688	0.361851	-0.93	0.3525
SEPP	1	-0.00040	0.091281	-0.00	0.9965
SEPP2	1	-0.00397	0.027702	-0.14	0.8862
goodld	1	1.209427	0.232461	5.20	<.0001
medld	1	1.683838	0.276832	6.08	<.0001
T	1	0.013952	0.005122	2.72	0.0068

PRUNES DRIED

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	67.71756	2.184437	4.28	<.0001
Error	116	59.26702	0.510923		
Corrected Total	147	126.9846			
Root MSE		0.71479	R-Square	0.53327	
Dependent Mean		2.16351	Adj R-Sq	0.40855	
Coeff Var		33.03832			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	64.48138	61.56219	1.05	0.2971
MART	1	0.016400	0.665986	0.02	0.9804
MART2	1	0.000170	0.005001	0.03	0.9729
APRT	1	-1.07021	0.687770	-1.56	0.1224
APRT2	1	0.007599	0.004550	1.67	0.0976
MAYT	1	1.191874	0.536038	2.22	0.0281
MAYT2	1	-0.00728	0.003305	-2.20	0.0295
JUNT	1	-0.31843	0.677713	-0.47	0.6393
JUNT2	1	0.001692	0.003812	0.44	0.6579
JULT	1	-0.10918	0.686732	-0.16	0.8740
JULT2	1	0.000611	0.003715	0.16	0.8696
AUGT	1	-1.23115	0.859156	-1.43	0.1546
AUGT2	1	0.006881	0.004663	1.48	0.1427
SEPT	1	-0.08853	0.921861	-0.10	0.9237
SEPT2	1	0.000661	0.005225	0.13	0.8996
MARP	1	0.003028	0.096534	0.03	0.9750
MARP2	1	0.001758	0.007018	0.25	0.8026
APRP	1	0.191889	0.222367	0.86	0.3900
APRP2	1	-0.04380	0.052747	-0.83	0.4080
MAYP	1	-0.45877	0.272230	-1.69	0.0946
MAYP2	1	0.124132	0.074516	1.67	0.0984
JUNP	1	-0.58071	0.454088	-1.28	0.2035
JUNP2	1	0.421315	0.258907	1.63	0.1064
JULP	1	-0.42309	3.834691	-0.11	0.9123

App. IX: Attachment

JULP2	1	0.717137	14.20886	0.05	0.9598
AUGP	1	-0.18853	1.262691	-0.15	0.8816
AUGP2	1	0.093623	1.500435	0.06	0.9504
SEPP	1	-0.22485	0.349868	-0.64	0.5217
SEPP2	1	0.152491	0.115055	1.33	0.1877
goodld	1	3.477851	0.850235	4.09	<.0001
medld	1	4.346277	1.476461	2.94	0.0039
T	1	-0.00626	0.015788	-0.40	0.6926

OLIVES

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	155.1464	5.004724	3.16	<.0001
Error	109	172.8498	1.585778		
Corrected Total	140	327.9962			
Root MSE		1.25928	R-Square	0.47301	
Dependent Mean		3.04426	Adj R-Sq	0.32314	
Coeff Var		41.36568			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-89.1325	42.23440	-2.11	0.0371
MART	1	-0.04541	0.381673	-0.12	0.9055
MART2	1	0.000323	0.002899	0.11	0.9115
APRT	1	0.079132	0.435205	0.18	0.8561
APRT2	1	-0.00072	0.002860	-0.25	0.8004
MAYT	1	-0.36643	0.571163	-0.64	0.5225
MAYT2	1	0.002744	0.003458	0.79	0.4293
JUNT	1	1.106473	1.254966	0.88	0.3799
JUNT2	1	-0.00665	0.006789	-0.98	0.3292
JULT	1	-0.10116	0.787907	-0.13	0.8981
JULT2	1	0.000951	0.004207	0.23	0.8216
AUGT	1	0.159061	1.141822	0.14	0.8895
AUGT2	1	-0.00071	0.006012	-0.12	0.9060
SEPT	1	1.118487	0.572113	1.96	0.0531
SEPT2	1	-0.00707	0.003314	-2.13	0.0351
MARP	1	-0.05646	0.118221	-0.48	0.6339
MARP2	1	-0.00067	0.006052	-0.11	0.9114
APRP	1	-0.44845	0.255466	-1.76	0.0820
APRP2	1	0.053166	0.031488	1.69	0.0942
MAYP	1	-0.11054	0.316166	-0.35	0.7273
MAYP2	1	0.016317	0.053549	0.30	0.7612
JUNP	1	0.231174	0.606144	0.38	0.7037
JUNP2	1	-0.01195	0.229392	-0.05	0.9585
JULP	1	2.298532	3.018581	0.76	0.4480

App. IX: Attachment

JULP2	1	-0.96294	1.169258	-0.82	0.4120
AUGP	1	-1.51696	2.419370	-0.63	0.5320
AUGP2	1	1.758159	2.557675	0.69	0.4933
SEPP	1	-0.06480	0.561297	-0.12	0.9083
SEPP2	1	0.098672	0.160094	0.62	0.5390
goodld	1	3.188444	1.358810	2.35	0.0208
medld	1	3.215515	1.752077	1.84	0.0692
T	1	0.057331	0.027139	2.11	0.0369

AVOCADOS ALL

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	85.08575	2.744702	2.01	0.0130
Error	52	71.14672	1.368206		
Corrected Total	83	156.2325			
Root MSE		1.16970	R-Square	0.54461	
Dependent Mean		2.84560	Adj R-Sq	0.27313	
Coeff Var		41.10576			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-23.0528	29.51597	-0.78	0.4383
MART	1	-0.03174	0.842723	-0.04	0.9701
MART2	1	-0.00071	0.005946	-0.12	0.9049
APRT	1	1.036308	0.774097	1.34	0.1865
APRT2	1	-0.00528	0.004936	-1.07	0.2899
MAYT	1	-0.39117	0.658440	-0.59	0.5550
MAYT2	1	0.003270	0.004129	0.79	0.4320
JUNT	1	-0.26417	0.474207	-0.56	0.5799
JUNT2	1	0.001003	0.002821	0.36	0.7235
JULT	1	0.690554	0.572226	1.21	0.2330
JULT2	1	-0.00518	0.003250	-1.59	0.1174
AUGT	1	-0.47084	0.756248	-0.62	0.5363
AUGT2	1	0.003690	0.004289	0.86	0.3936
SEPT	1	0.234225	0.631030	0.37	0.7120
SEPT2	1	-0.00152	0.003646	-0.42	0.6791
MARP	1	-0.20327	0.154864	-1.31	0.1951
MARP2	1	0.010782	0.010857	0.99	0.3253
APRP	1	0.619775	0.631880	0.98	0.3312
APRP2	1	-0.15128	0.165607	-0.91	0.3652
MAYP	1	-0.62650	0.861836	-0.73	0.4705
MAYP2	1	0.284842	0.295752	0.96	0.3399
JUNP	1	-1.82613	1.844523	-0.99	0.3267
JUNP2	1	3.001382	1.642820	1.83	0.0734
JULP	1	9.110365	6.877266	1.32	0.1911

App. IX: Attachment

JULP2	1	-40.6480	17.89718	-2.27	0.0273
AUGP	1	-2.26924	2.742791	-0.83	0.4118
AUGP2	1	2.252092	1.955835	1.15	0.2548
SEPP	1	-0.80717	0.901123	-0.90	0.3745
SEPP2	1	0.449956	0.520501	0.86	0.3913
goodld	1	-0.00054	1.405958	-0.00	0.9997
medld	1	-0.78762	4.706215	-0.17	0.8677
T	1	-0.07959	0.038225	-2.08	0.0423

POTATOES IRISH ALL

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model YIELD
Dependent Variable YIELD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	709.5533	22.88882	8.00	<.0001
Error	56	160.1594	2.859989		
Corrected Total	87	869.7127			
Root MSE		1.69115	R-Square	0.81585	
Dependent Mean		17.73784	Adj R-Sq	0.71391	
Coeff Var		9.53414			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	0.333858	75.41142	0.00	0.9965
MART	1	0.417745	0.531917	0.79	0.4356
MART2	1	-0.00397	0.004038	-0.98	0.3301
APRT	1	-0.75023	0.565863	-1.33	0.1903
APRT2	1	0.003831	0.003764	1.02	0.3132
MAYT	1	0.224857	0.772239	0.29	0.7720
MAYT2	1	-0.00050	0.004809	-0.10	0.9177
JUNT	1	0.480214	0.966926	0.50	0.6214
JUNT2	1	-0.00241	0.005388	-0.45	0.6568
JULT	1	-0.29994	1.211193	-0.25	0.8053
JULT2	1	0.002545	0.006561	0.39	0.6996
AUGT	1	-0.48014	1.686387	-0.28	0.7769
AUGT2	1	0.001350	0.008932	0.15	0.8804
SEPT	1	1.299713	0.764183	1.70	0.0945
SEPT2	1	-0.00838	0.004429	-1.89	0.0637
MARP	1	0.018492	0.368479	0.05	0.9602
MARP2	1	-0.00907	0.044139	-0.21	0.8380
APRP	1	-1.24773	1.066001	-1.17	0.2468
APRP2	1	0.312334	0.371121	0.84	0.4036
MAYP	1	0.564348	0.959403	0.59	0.5587
MAYP2	1	-0.03057	0.269167	-0.11	0.9100
JUNP	1	2.435078	1.871713	1.30	0.1986
JUNP2	1	-1.46141	0.996627	-1.47	0.1481
JULP	1	1.499588	2.656963	0.56	0.5747

App. IX: Attachment

JULP2	1	0.055446	2.530661	0.02	0.9826
AUGP	1	-2.17717	3.119154	-0.70	0.4881
AUGP2	1	1.391981	2.261574	0.62	0.5407
SEPP	1	0.739719	1.310741	0.56	0.5748
SEPP2	1	-0.49035	0.625658	-0.78	0.4365
goodlld	1	-11.9884	5.115515	-2.34	0.0227
medlld	1	-14.3276	2.378803	-6.02	<.0001
T	1	0.027109	0.041254	0.66	0.5138

The statistical model for irrigation water use

A simple statistical model is estimated to estimate the effect of climate changes on irrigation water use. Because of the limited number of observations and the potential multicollinearity problem, a linear specification is used. The dependent variable is the consumptive water use for irrigation per acre. The independent variables include monthly average maximum daily temperatures from March to August and monthly precipitations from May to July.

A single water use model is estimated for the whole study region. Water use data are available for only two years (1985 and 1990). In addition, irrigation takes place only in counties with inadequate precipitations. Because of the limited number of observations, we are unable to estimate a water use model for each of the four production regions as we did in the case of crop yield functions.

The estimation results for the water use model are presented in the attachment. The model explains 42% of variations of irrigation water use across the study region. The results suggest that maximum daily temperatures in July have the largest impact on water use. An increase in the average maximum daily temperatures in July by one degree F^0 will increase irrigation water use by 0.14 acre-feet per acre. Precipitations in June and July reduce irrigation water use. An increase in precipitations by one inch reduces consumptive water use for irrigation by 0.28 and 0.22 acre-feet per acre.

The Irrigation Water Use Model

The SYSLIN Procedure
Ordinary Least Squares Estimation

Model] Irrwater
Dependent Variable Irrwater

Analysis of variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	12.94589	1.438432	4.26	0.0004
Error	52	17.56388	0.337767		
Corrected Total	61	30.50976			

Root MSE 0.58118 R-Square 0.42432
Dependent Mean 2.29907 Adj R-Sq 0.32468
Coeff Var 25.27875

Parameter Estimates

variable	DF	Parameter Estimate	Standard Error	t value	Pr > t
Intercept	1	-4.27605	1.439573	-2.97	0.0045
MART	1	0.027865	0.033931	0.82	0.4153
APRT	1	-0.07047	0.063736	-1.11	0.2739
MAYT	1	-0.03882	0.068289	-0.57	0.5722
JUNT	1	0.042167	0.051987	0.81	0.4210
JULT	1	0.140693	0.080839	1.74	0.0877
AUGT	1	-0.04364	0.079513	-0.55	0.5855
MAYP	1	0.113601	0.080381	1.41	0.1635
JUNP	1	-0.27838	0.459272	-0.61	0.5471
JULP	1	-0.21776	0.412982	-0.53	0.6002